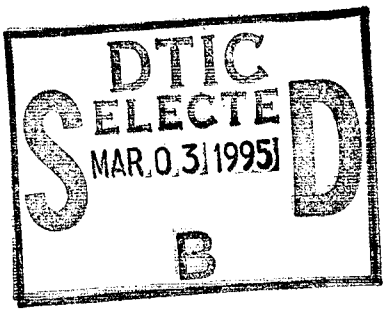
253850-4-T

Final Report

RETRIEVAL DISPLAY AND ANALYSIS SUPPORT TOOL REQUIREMENTS ANALYSIS

Gary A. Stahl
Electro-Optics Laboratory

October 1994



Sponsored by:
Defense Technical Information Center
Bldg. 5, Room 205B
Cameron Station
Alexandria, Virginia 22304-6145

Defense Electronic Supply Center
Dayton, Ohio 45444-5180

Prepared for:
Contract No. DLA900-88-D-0392/0052

19950224 012

ERIM
P.O. Box 134001
Ann Arbor, MI 48113-4001

ERIM-320

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

1. AGENCY USE ONLY (*Leave Blank*)	2. REPORT DATE	3. REPORT TYPE AND DATES COVERED
	October 1994	Final

4. TITLE AND SUBTITLE
Retrieval Display and Analysis Support Tool
Requirements Analysis

5. FUNDING NUMBERS
DLA900-88-D-0392
D.O. 52

6. AUTHOR(S)
Gary A. Stahl

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
Environmental Research Institute of Michigan
PO Box 134001
Ann Arbor, Michigan 48113-4001

8. PERFORMING ORGANIZATION REPORT NUMBER
253850-4-T

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)
Defense Technical Information Center
Attn: Dr. Forrest Frank (code DTIC-AI)
Bldg. 5, Room 205B
Cameron Station
Alexandria, Virginia 22304-6145

10. SPONSORING/MONITORING AGENCY REPORT NUMBER

11. SUPPLEMENTARY NOTES

12a. DISTRIBUTION/AVAILABILITY STATEMENT
Unlimited

12b. DISTRIBUTION CODE

13. ABSTRACT (*Maximum 200 words*)

This report establishes a methodology for assessing the information and data requirements of users of remote sensing within the U.S. Government. The parameters needed for characterizing data requirements are identified and related to the parameters of available sensors. In the course of performing the requirements analysis a sizable database of users, information requirements and sensors was developed.

14. SUBJECT TERMS	15. NUMBER OF PAGES
Remote Sensing, Analysis, Sensor	69
	16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT
Unclassified	Unclassified	Unclassified	Same as report

CONTENTS

FIGURES

TABLES

1.0 Introduction. The development of a Retrieval Display & Analysis Support Tool was motivated by the need to provide U.S. Government users of remote sensing with a means of identifying additional sources of data to support their organizational missions. The requirements analysis task involved three sub tasks:

1. Identify users of remote sensing within the U.S. Government.
2. Assess the users' needs within the context of their mission.
3. Characterize the types of data required to support users' needs and provide a means of identifying sensors capable of meeting the user's needs.

The overall objective of RDAST is to develop a prototype tool for assessing the utility of a wide range of sensors for addressing issues of interest to a variety of organizations within the U.S. Government. Given the current situation of tightly constrained federal budgets, expanding information needs, and growing capability of civilian sensors, this tool will provide a means of assessing several important issues.

• Assessing the utility of civilian sensors for tasks currently performed by government operated sensors. (Some tasks may be accomplished using data available from commercial systems. Potentially at a lower cost than from government systems or potentially reducing the burden on government systems. This could in turn reduce the need to procure and operate additional government systems).

• Assessing the utility of government systems to perform new tasks. (Some government systems are not fully tasked. Identifying new applications could permit them to be more fully utilized).

• Assessing the vulnerability of U.S. national security interests to newly operational and developing civilian and foreign sensor systems. New and planned civilian sensors are being developed both in the U.S. and abroad. While most are designed for civilian or commercial purposes, many can potentially provide information of intelligence value to hostile governments.

RDAST is not intended initially to be delivered as a complete database. Rather, the objective is to identify key data requirements and develop a prototype data structure to facilitate selection and sampling of examples of available remotely sensed data and products to permit analysts to assess their potential value.

2.0 Sources. This is an unclassified project. The data included in this study all come from open sources. Data on user organizations come from publications by the

organizations themselves or from unclassified directories. A key source for much of this information is the Gale Research Institute.[1]

Data on sensors is all from open source publications, articles and brochures published by the sensor operators.

2.1 Identifying User Organizations. Users of remotely sensed data exist throughout the U.S. Government and at many levels. Figure 1 shows the U.S. Government Departments and Agencies identified in this study as containing organizations involved in the use of remotely sensed data.

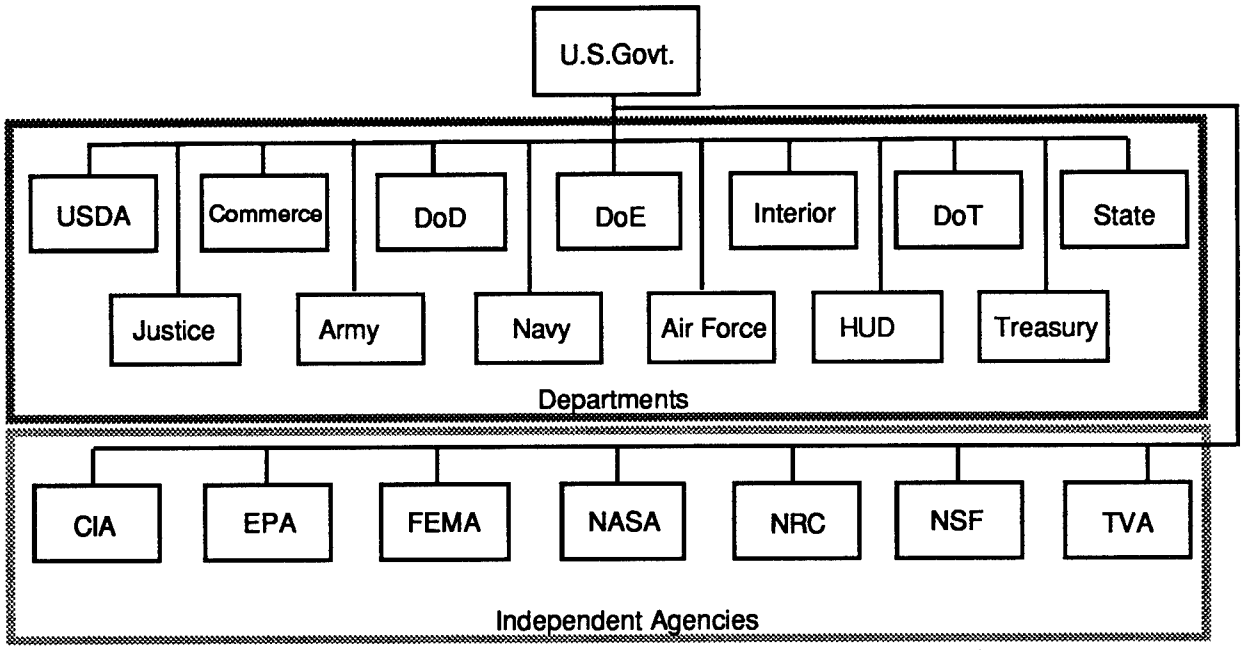


Figure 1. U.S. Government Departments and Agencies

2.2 Levels of Users. Users are located at a variety of levels within the U.S. Government. This study focused on the first level at which an organization's primary mission could be identified as one likely to require the use of remotely sensed data. In most cases these organization were found in the third or fourth layer of the government organization as is illustrated in Figure 2.

[1] Government Research Directory, 7th edition, 1993 - 94, Gale Research Inc., Detroit, MI.

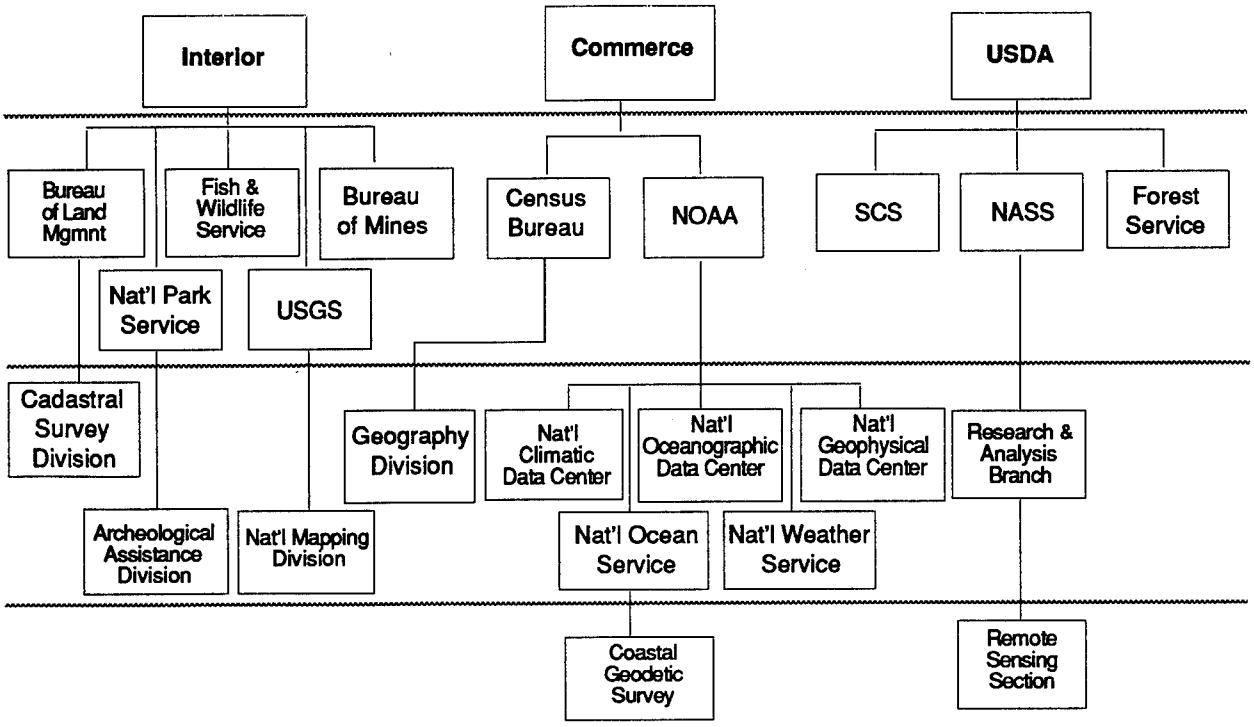


Figure 2. Examples of User Organizations at Various Levels Within the U.S. Government

2.3 Multiple & Overlapping Missions. There are also, within the U.S. Government, a number of organizations which perform similar functions. For example; both the Defense Mapping Agency (under DoD) and U.S. Geologic Survey (under Dept. of the Interior) are involved in Topographic Mapping and Charting. They differ in the scope and regions of responsibility. The Tennessee Valley Authority also does mapping within its area of responsibility, as does the Bureau of Land Management. There is also the National Ocean Service's Coastal and Geodetic Survey (under NOAA in the Commerce Dept.), which does coastal mapping in U.S. waters.

Some organizations have multiple missions. For example; both the Defense Department and Central Intelligence Agency are involved in imagery analysis for intelligence purposes, however, differ in area of interest and scope. Figure 3 illustrates a few areas where overlapping missions occur. There are also numerous organizations either involved in or who fund Global Environmental Change research. There are several organizations involved in Polar Studies, but some only in the Arctic (i.e. the U.S. Navy, NRL and NPOC). Both NOAA's U.S. Weather Service and the Air Force Weather Service are engaged in weather prediction.

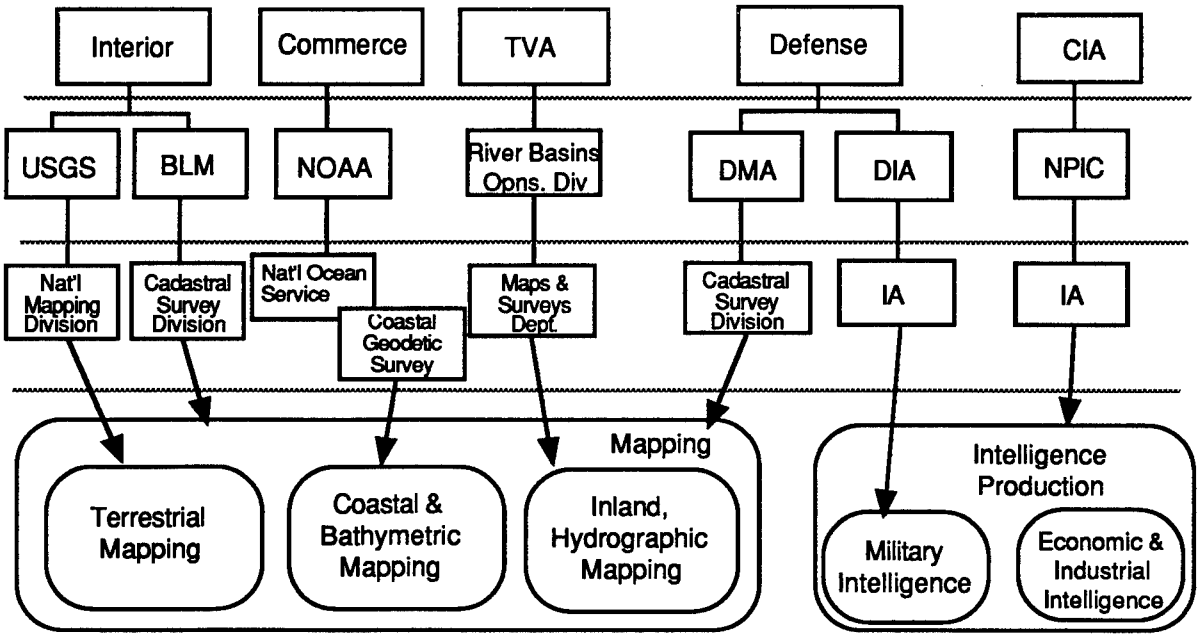


Figure 3. U.S. Government Organizations Performing Similar Missions.

These examples are not meant as a critique of government bureaucracy, nor are they meant to imply that such overlaps should not exist. In most cases there is good reason for the organizations to be performing the missions as they are. Most are focused on specific areas or problems. The fact that many of these organizations are performing similar missions is significant to this study in that it implies that they are engaged in similar analytical tasks and probably require similar data to perform those tasks. This further implies that they might be able to make use of a common suite of sensors.

3.0 Requirements Analysis Process. The Requirements Analysis was performed in a four step process:

- Identify Users and their Missions
- Identify the Analytical Tasks required to perform each Mission.
- Identify Information Elements needed to support the Analytical Tasks.
- Identify Data Types required to meet Information needs.

3.1 Users. The first step was to produce a file of Users. Unique office codes were assigned to eliminate duplicate names. For example, there is a "Cadastral Survey Division" under both DMA and BLM, Codes assigned were DMA-CSD and BLM-CSD. These names also help trace the office back to its parent branch and department or agency. Because of the multilayered nature of the federal government User's offices were identified down to only three levels. In a few cases offices at a lower level were

identified by simply appending the lower office name. The following data fields were included for each office:[2]

1. Department or Agency
2. Department or Agency Abbreviation
3. Branch
4. Branch Abbreviation
5. Office Name
6. Office Code
7. Mailing Address
8. City
9. State
10. Zip Code
11. Phone Number
12. Mission

3.2 Missions. Missions were derived from official mission statements. Due to the unclassified nature of this study, military requirements and intelligence community requirements are expressed in rather generic terms. In some cases the real missions may differ from the stated mission. No attempt was made to correct or even identify discrepancies within this class of users.

One example of where a mission statement has differed from the true mission is the Federal Emergency Management Agency FEMA. FEMA's overt mission was disaster relief and damage assessment. Its real mission was protection of the national command and control system in the event of a nuclear attack. With the end of the Cold War FEMA is now performing in earnest, the mission that once only served as a cover for its real mission.

Some mission statements are quite broad and actually imply multiple missions. Offices with multiple missions were listed multiple times. Missions which lacked any analytical component, such as merely archiving data, were omitted.

3.3 Analysis Tasks. The next step was to break down Missions into Analysis Tasks. Analysis Tasks are the primary analytical activity or activities that must be performed in order to carry out the mission. For example; the USGS has a mission of Terrestrial Mapping. This implies several Analysis Tasks:

- Land Use/Land Cover Classification
- Delineation of Water Bodies
- Mapping of Roads and Railroads
- Deriving Topographic Contours

3.4 Information Elements. Information elements are key pieces of data required to accomplish an analytical task. Most follow directly from an analysis task. For example; the task of Land Use Classification implies a need for imagery on which, forests, crop

---

[2] A printout is included as Appendix D. The file was initially organized as an Excel spreadsheet but is now a FoxPro Database file. Additional fields recommended are; 13. Fax Number, 14. Point of Contact, and 15. Internet/EMail address, (see recommendations).

lands, and urban land can easily be distinguished. A mapping task may further imply a need for geometric accuracy to permit mensuration and accurate geolocations.

3.5 Data Requirements. There may be a variety of data types capable of providing a given information element. For example, forest, crop lands, urban areas, water bodies roads and railways are all distinguishable by visual analysis of optical, multispectral or radar imagery, if there is adequate resolution. Some information elements may be met using a variety of analysis techniques. For example; most optical and multispectral systems can produce stereo pairs. Elevation may be derived by for stereo imagery by measuring the parallax at selected points. Radar imagery can also produce terrain elevation by measuring differences in layover or by interferometric techniques.

Figure 4 illustrates some of the multiple relationships which exist between Users, Missions, Analysis Tasks, Information Elements and Sensor Data Types.

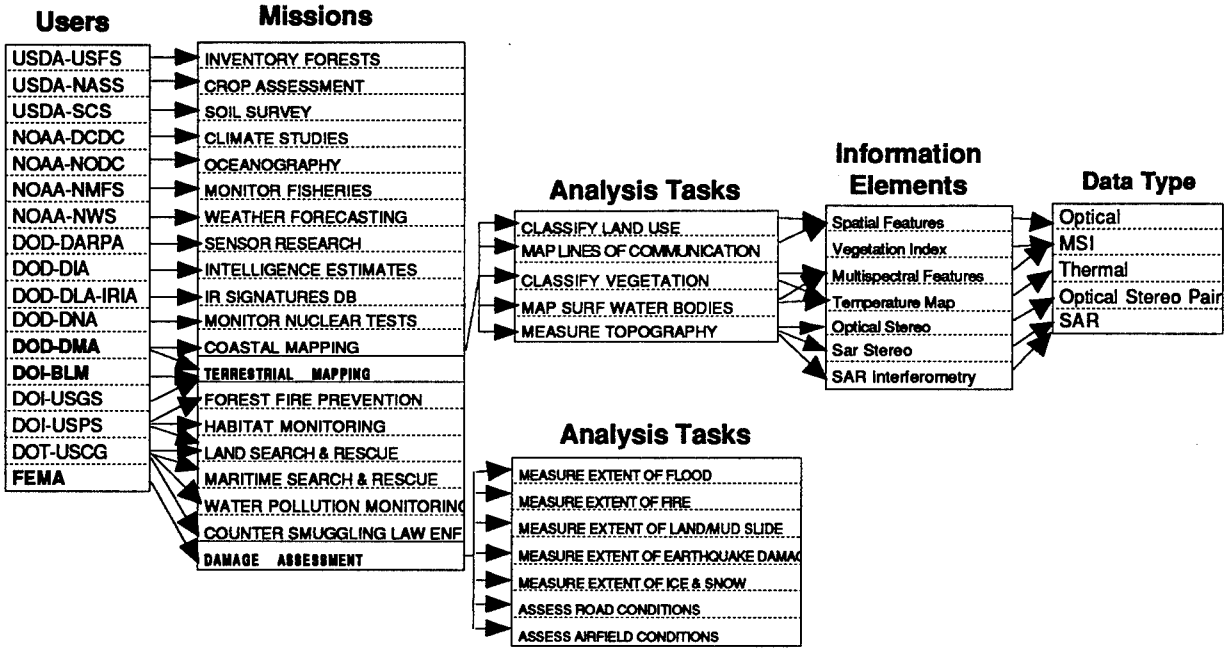


Figure 4. Relationships of Users, Missions, Analysis Tasks & Information Elements

Tables of Users, Missions, Analysis Tasks and Information Elements were developed and linked together in a relational database. This allows one to trace the requirements chain from an individual user office to its information requirements. One could also begin with an information requirement and determine what users share it. Information Elements were not directly linked to specific data types because the actual specification of data requirements is more complicated than a simple linkage.

4.0 Data Description Criteria. When a User specifies the data required to perform an Analysis Task, (in support of a Mission), the requirements are usually expressed using some or all of the following criteria:

• Resolution: This requirement is driven by the spatial dimensions of the object or phenomena being observed or the sampling dimensions of the data base being

populated. Requirements vary greatly. Ocean phenomena are usually mapped in scaled measured in hundreds of meters, while agricultural assessments typically require resolutions from 30 to 100 meters. Urban planning and mapping requires 10 to 20 meter resolution while many military intelligence tasks require resolution between 30 cm and 10 meters (for B&W panchromatic imagery).

• Extent of Coverage is driven by the total area to be covered and to some extent the time within which an area must be covered.

• Timeliness: Some Missions are more urgent than others and so have different standards for what is an acceptable delay from data collection to analysis, (in some cases hours, days, weeks, or months).

• Periodicity: Surveillance or Monitoring tasks require recurring and sometimes very frequent coverage. Military intelligence tasks demand at least a surge capability of daily or even multiple collections per day. Typical standing requirements are expressed as Daily, 3 Days, Weekly, Monthly, Quarterly, and Annual. High resolution sun-synchronous imaging satellites offer a maximum of one coverage per day with the time over target dictated by the orbit. Military surge requirements imply a need for a constellation of several such satellites. Some tasks require data collected at specific times of year. Topographic mapping is best performed with imagery collected in Fall or Winter when leaves are off the trees.[3]

• Repeatability of Collection Geometries is important for change detection and topography measurement.

• Stereo Tasking is important for topography, terrain analysis, and for many types of detailed intelligence analysis.

• Radiometric Corrections are important for temperature measurements, vegetation classification and change detection.

• Geometric Corrections are important for spatial measurements.

• Georeferencing and Geocoding Capabilities are important for Geographic Information Systems (GIS) applications.

• Existence of and Accessibility of Archives are essential to change detection. Seasonal coverage is also significant for change detection. It is best to compare scenes from the same seasons.

• Legal Restrictions on Use: Security classification or copyrights may limit utility. Releasability to or from foreign governments can be both a benefit and a disadvantage. Many U.S. Government users would be reluctant to rely solely on a foreign sensor unless the supply of data could be guaranteed.

---

[3] This is not possible in the Tropics where trees retain their leaves year round. Long term weather patterns can also be significant. Some areas are cloud covered nearly all the time and can only be mapped by radar. Low light conditions and extended periods of cloudy weather also pose problems for optical sensors in the polar regions.

• Cost: U.S. Government Users of Government operated sensors tend to view data as an almost 'free good'. The costs are seen most readily in terms of the effort required to collect and exploit the data or in terms of lost opportunities in collecting one set of data at the expense of another. Aside from the agencies which actually operate the sensors, few users have any idea of the dollar cost per scene. The reverse is true for data acquired from sources outside the government.

5.0 Sensor Description. One data requirements have been adequately described the next step is to find sensor capable of providing data that meet the information need. Sensor data are described by a set of terminology which while sometimes different from the terms used to state the data requirement are usually analogous enough to permit making a good match between the requirement and sensor.

5.1 Sensor Characterization. Sensor data may be characterized by certain image quality and capability measures. These measures differ for different sensor types, as illustrated by Table 1.

Table 1. Sensor Characterization Criteria

	Optical	**MSI**	**Thermal**	**SAR**
Resolution:	Ground Sample Distance (GSD)	Ground Sample Distance (GSD)	Ground Sample Distance (GSD)	Impulse Response IPR
Image Quality:	Interpretability Scale, NIIRS % Cloud Cover	% Cloud Cover	% Cloud Cover	Sidelobe Envelope SNR, Contrast Ratio
Band of Operations:	Band of Operation	Bands of Operation	Band or Bands of Operation &	Center Frequency & Band Width
Sensitivity:	SNR, CR Gamma	NE$\Delta\rho$	NEΔT	NEP, CR,SNR

Table 1 is not an exhaustive list it only serves to illustrate that while there are analogous characterization criteria for the various sensor types, it is often difficult to compare sensors of different types directly. The abbreviations in this table are defined in Appendix E.

5.2 Sensor Utility. Most people have little difficulty understanding the relationship between spatial resolution and the ability of a sensor to provide information. As resolution improves the image looks sharper, more recognizable, and more and more details become apparent. The fact that the benefits of greater spatial resolution is so readily apparent has sometimes led to development of higher resolution systems.

An additional factor which should be considered is the benefit of the information contained in the colors of the visible spectrum and other parts of the electromagnetic

spectrum. Natural color and false color imagery (using the near infrared region) can provide valuable image analysis cues that are often more useful than higher resolution panchromatic imagery. The infrared and microwave regions also contain unique information about the thermal, dielectric and textural properties of a scene. The fact that these properties are not normally perceivable to humans makes data from these sensors harder to understand. It is this same fact that makes these data all the more valuable.

Multispectral Imaging Systems, Synthetic Aperture Radars and Microwave Radiometers are three classes of sensors that produce data sets which contain unique information. In many cases the information is not available directly from the sensor, rather it must be derived through some additional processing of the raw sensor data. Over the years, many processing algorithms and analysis techniques have been developed to derive specific information from these sensors. Numerous band utility studies have been conducted to determine the utility of specific band within the electromagnetic spectrum, (alone or in combination) for deriving certain types of information.

5.3 Sensor Bands. Sensors operate within specific of bands within the electromagnetic spectrum. In order to categorize the sensors it is helpful to first categorize the bands over which they operate. For optical and thermal sensors, band placement is dictated to a large degree by the transmission characteristics of the atmosphere. Gases in the atmosphere, (primarily, water vapor, carbon dioxide and ozone), absorb radiation in varying percentages across the spectrum. Where absorption is low, transmission is high, creating "windows" through which remote sensing is possible. Figure 5 illustrates the location of transmission windows and absorption bands.

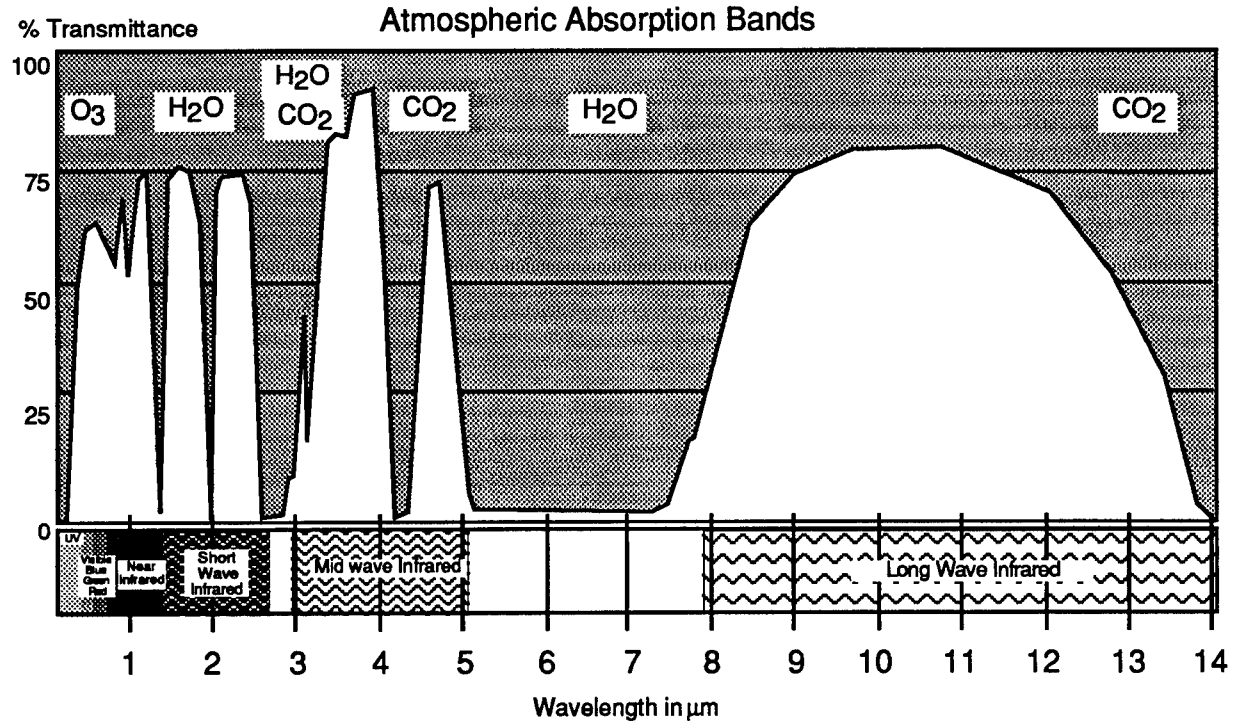


Figure 5. Atmospheric Absorption Bands & Transmission Windows 0 to 14 µm.

While some weather and atmospheric instruments sense in the absorption bands, most sensors focused on the earth's surface have bands positioned to make optimal use of the transmission windows. Table 2 summarizes the bands most commonly employed in multispectral imaging systems.

Table 2. Generic Multispectral Bands

Band Name	Band Width	Remarks
Ultraviolet (UV)	3-400 nm	Reflected EMR. Not visible, largely absorbed in upper atmosphere
Blue	400 - 500 nm	Reflected blue visible light, scattered by atmosphere
Blue-Green	450 - 550 nm	Reflected visible light between blue & green.
Green	500 - 600 nm	Reflected green visible light.
Red	600 - 700 nm	Reflected red visible light.
Near Infrared (NIR)	700 - 1100 nm	Reflected infrared light, not visible to the eye.
Shortwave Infrared	1550 - 2550 nm	A mixture of reflected and emitted EMR, not visible to the eye.
Mid wave Infrared	3000 - 5000 nm	Emitted EMR proportional to temperature, not visible to the eye.
Long wave Infrared	8000 - 14000 nm	Emitted EMR proportional to temperature, not visible to the eye.
Visible Panchromatic	400 - 700 nm	Reflected light visible to the eye.
Visible and NIR	400 - 1100 nm	Reflected light including near infrared, not visible to the eye.

All optical and multispectral scanners include some or all of these generic bands. The multispectral scanners on satellites seldom cover the UV or blue bands because these bands suffer extreme atmospheric absorption and scattering.[4] Most satellites use a blue-green band instead of blue.[5]

The actual wavelengths covered by specific sensors vary slightly from sensor to sensor and some subdivide the bands. For example; Landsat's blue-green bandwidth is from 450 to 520 nm, the green is 520 to 600 nm and red is 630 to 690 nm. Landsat's NIR band covers from 760 to 900 nm. The SWIR is covered in two bands (1550 to 1750 nm and 2080 to 2350 nm). There is no mid wave IR band and the long wave IR band covers from 10400 to 12500 nm.

Other sensors use different bands. The differences are due to the technology at the time of the sensors' design, the detectors used or the specific applications for which the sensor was intended.

Most current multispectral scanners also include a visible panchromatic band, covering the entire visible region and sometime extending into the near infrared. This band generally yields higher resolution than the narrower bands (usually twice as good as the individual bands). The panchromatic band may be used alone or for "sharpening" (enhancing the spatial resolution) of the other bands. Sharpening does not actually improve the resolution of the narrow bands, but it allows an interpreter to visually associate the colors with the spatial detail of the panchromatic band.

---

[4] Most satellites with bands in the blue use them to measure clouds and haze rather than to image the earth. Likewise satellites with UV bands use them for measuring ozone concentration.

[5] Sea WiFS is an exception to this rule in that it has several blue bands. Sea WiFS's purpose is to support oceanographic research. For this application, blue band information is critical despite the difficulties in collecting it.

Synthetic aperture radars (SARs), scatterometers and passive microwave radiometers operate at the other end of the electromagnetic spectrum. Their bands of operation include wavelengths measured in centimeters and meters rather than nanometers and microns. Usually these bands are referred to by frequency (hertz or cycles per second) rather than by wavelength. In the microwave region the bands have been assigned letters rather than colors. Table 3 lists the standard microwave bands.

SAR's are active sensors which transmit energy and produce an image of the microwave reflectivity of the surface. They are capable of producing imagery day or night and through clouds. The resolution of a SAR is independent of range. It is a function of the transmitted bandwidth (for range resolution) and antenna beam width (for azimuth resolution). Scatterometers are active microwave instruments which do not form images, but rather provide only a statistical measure of the microwave reflectivity of the surface. Passive microwave radiometers measure the microwave emissivity of the surface (or brightness temperature). Their resolution is a function of their antenna beam width. Microwaves in the Ku, V and W bands are attenuated by rain and clouds. This makes them useful for meteorology.

Table 3. Microwave Bands

Band	Wavelength (cm)	Frequency (Ghz)
P Band	133 - 76.9	.225 - .39
L Band	76.9 - 19.4	.39 - 1.55
S Band	19.4 - 7.69	1.55 - 3.9
C Band	7.69 - 5.21	3.9 - 5.75
X Band	5.21 - 2.75	5.75 - 10.9
Ku Band	2.75 - 1.67	10.9 - 18
K Band	1.67 - 1.13	18 - 26.5
Ka Band	1.13 - 0.83	26.5 - 36.6
Q-Band	0.83 - 0.063	36.6 - 46
V Band	0.063 - 0.053	46 - 56
W Band	0.053 - 0.03	56 - 100

5.4 Band Utility. The various bands may be used alone or in combination with others to derive specific information. Tables 4,5 and 6 attempt to summarize the utility of a set of generic bands for a variety of applications. There are separate tables for Multispectral Imaging Systems, Synthetic Aperture Radars, and Passive Microwave Radiometers. The relative importance of a given band or bands have been rated according to the following criteria:

Band Utility Definitions:

Primary (PRI) - The single band with the highest information content related to the task. Used alone it can answer most of the problem.

Alternate (ALT) - A band which can provide almost as much information as the Primary band but not quite. The second choice if the Primary band is not

available. If two bands can provide the same information both will be listed as Alternates and no Primary band.

Substitute (SUB) - A band which can provide some information as the Primary or Alternate bands but not as accurately or efficiently. The third choice.

Essential (ESS) - One of several bands each of which are required as inputs into a multi-band transform or analysis process. All are equally important and if any are absent the process will not work.

Contributory (CON) - One of several bands in a multi-band process which add information but which are not necessarily required to perform the task.

Any (ANY) - One of many bands that can perform a task equally well.

One may enter the tables with an information element and produce a list of required or desirable bands which relate to the information element. Alternatively one may enter with a set of bands and produce a list of potential information elements. In this way they can provide insight into potential uses for specific sensors or data requirements for specific tasks. Note that these tables contain information on spatial resolution. Resolution requirements must be considered separately.

Table 4: Multispectral Band Applications

	Visible	Ultraviolet	Reflected					Mixed	Thermal	
	VIS/PAN	**UV**	**BLUE**	**BLU-GRN**	**GREEN**	**RED**	**NIR**	**SWIR**	**MWIR**	**LWIR**
Information Element	.4-.7	.2-.3	.4-.5	.45-.55	.5-.6	.6-.7	.7-1.1	1.1-2.5	3.0-5.0	8.0-14.0
Land Surface										
Assess Vegetation Vigor					CON	ESS	ESS	CON	CON	CON
Discriminate Surface Water from Land	SUB						ALT	ALT	ALT	ALT
Classify Surface Materials Spectrally		CON	CON	CON	CON	CON	CON	CON	CON	CON
Classify Surface Minerals Spectrally		CON	CON	CON	CON	CON	CON	ESS	CON	CON
Discriminate Soil Types by Emissivity									ALT	ALT
Discriminate Soil Types by Reflectance	SUB		CON	ESS	ESS	ESS	ESS	CON		
Discriminate Soil Types by Drainage Pattern	ALT		SUB	SUB	SUB	SUB	SUB	ALT	ALT	ALT
Detect & Measure Thermal Plumes									ALT	ALT
Detect Man-made Objects Spectrally		CON	CON	CON	CON	CON	CON	CON	CON	CON
Detect Man-made Objects Thermaly									ALT	ALT
Estimate Land Surface Emisivity									ALT	ALT
Estimate Land Surface Temperature									ALT	ALT
Estimate Soil Moisture								ALT	ALT	ALT
Estimate Soil Moisture by Plant Indicators	SUB		SUB	SUB	SUB	ESS	ESS	CON		
Map Land Surface Thermal Features									ALT	ALT
Measure Topography by Stereo	PRI		SUB	SUB	SUB	SUB	SUB			
Spectral Land Use Classification		CON	CON	CON	CON	CON	CON	CON	CON	CON
Visual Spatial Analysis	PRI									
Classify Vegetation by Species	SUB		CON	CON	CON	ESS	ESS	CON		
Classify Vegetation by Stage of Growth	SUB		CON	CON	CON	ESS	ESS	CON	CON	CON
Detect Multispectral Change			CON	CON	CON	CON	CON	CON	CON	CON
Detect Land Disturbances			CON	CON	CON	CON	CON	CON	CON	CON
Detect Camoflage					CON	ESS	ESS	CON		
Detect Shallow Buried Objects	CON					CON	CON	CON	ALT	ALT
Ice & Snow										
Detect & Classify Sea Ice	CON		CON	CON			CON	CON	CON	CON
Classify Ice Types			CON	CON			CON	CON	CON	CON
Classify Snow Types			ESS	ESS			CON	ESS	CON	CON
Estimate Snow & Ice Volume			ESS	ESS			CON	ESS	CON	CON

Table 4: Multispectral Band Applications (continued)

Information Element	Remarks
Land Surface	
Assess Vegetation Vigor	Red/NIR ratio is critical
Discriminate Surface Water from Land	Any IR band will do. Nighttime imagery is best for MWIR, and LWIR, NIR I best in Daylight.
Classify Surface Materials Spectrally	Several from each class, reflected, mixed & thermal
Classify Surface Minerals Spectrally	Several from each class, reflected, mixed & thermal
Discriminate Soil Types by Emissivity	Multiple thermal IR bands
Discriminate Soil Types by Reflectance	Multiple reflective bands
Discriminate Soil Types by Drainage Pattern	Resolution is important
Detect & Measure Thermal Plumes	Either thermal band
Detect Man-made Objects Spectrally	Several from each class, reflected, mixed & thermal
Detect Man-made Objects Thermaly	Either thermal band
Estimate Land Surface Emisivity	Either thermal band
Estimate Land Surface Temperature	Either thermal band
Estimate Soil Moisture	Soil Moisture Often Manifests as a surface temperature difference, or as a lower reflectance
Estimate Soil Moisture by Plant Indicators	Indicator species and plant vigor are good clues to soil moisture
Map Land Surface Thermal Features	Multiple thermal IR bands
Measure Topography by Stereo	Resolution is important
Spectral Land Use Classification	Several from each class, reflected, mixed & thermal
Visual Spatial Analysis	Resolution is important for this task
Classify Vegetation by Species	As many reflective bands as practical
Classify Vegetation by Stage of Growth	As many bands as practical
Detect Multispectral Change	As many bands as practical
Detect Land Disturbances	As many bands as practical
Detect Camoflage	SWIR is important
Detect Shallow Buried Objects	Thermal bands show moisture effects, Red & Nir show vegetation changes, Visible can show subsidence
Ice & Snow	
Detect & Classify Sea Ice	Several from each class, reflected, mixed & thermal
Classify Ice Types	Several from each class, reflected, mixed & thermal
Classify Snow Types	Several from each class, reflected, mixed & thermal
Estimate Snow & Ice Volume	Several from each class, reflected, mixed & thermal

Table 4: Multispectral Band Applications (continued)

	Visible	Ultraviolet	Reflected					Mixed	Thermal	
	VIS/PAN	**UV**	**BLUE**	**BLU-GRN**	**GREEN**	**RED**	**NIR**	**SWIR**	**MWIR**	**LWIR**
Information Element	.4-.7	.2-.3	.4-.5	.45-.55	.5-.6	.6-.7	.7-1.1	1.1-2.5	3.0-5.0	8.0-14.0
Ocean, Lakes & Coastal Regions										
Estimate Water Depth			CON	ESS	ESS	CON	CON			
Detect Oil Sheens		PRI	ALT	ALT	ALT	ALT				
Detect Oil Slicks	SUB	ESS	SUB	SUB	SUB	SUB			ALT	ESS
Detect Surfactants on Water	CON	CON	CON	CON	CON	CON	CON	CON	CON	CON
Estimate Water Surface Temperature									ALT	PRI
Map Underwater Features	SUB		CON	ESS	ESS	ESS	CON			
Measure Ocean Surface Color			CON	ESS	ESS	ESS	CON			
Measure Ocean Waves	PRI	SUB	SUB	SUB	SUB	SUB				
Detect Ship Wakes									ALT	ALT
Classify Ship Wakes	PRI	SUB	SUB	SUB	SUB	SUB				
Meterology & Climatology										
Classify Clouds	PRI			CON	CON	CON			CON	CON
Discriminate Clouds from Land	PRI			ALT	ALT	ALT			ESS	ESS
Discriminate Clouds from Sea or Water	PRI			ALT	ALT	ALT		ESS	ESS	ESS
Discriminate Clouds from Snow & Ice	PRI			ALT	ALT	ALT		ESS	ESS	ESS
Damage Assessment										
Detect Fire	CON					ALT		SUB	ALT	ALT
Detect Smoke	PRI		ALT	ALT	ALT	ALT	SUB			
Discriminate Smoke from Clouds	CON					CON	CON	ESS	CON	CON
Condition of Roads, Bridges & Airfields	PRI									
Map Extent of Fire Damage	CON		CON	CON	CON	CON	CON	CON	CON	CON
Map Extent of Flood Damage	CON		CON	CON	CON	CON	CON	CON	CON	CON
Map Extent of Storm Damage	CON		CON	CON	CON	CON	CON	CON	CON	CON
Map Extent of Earthquake orLandslide Damage	CON		CON	CON	CON	CON	CON	CON	CON	CON

Table 4: Multispectral Band Applications (continued)

Information Element	Remarks
Ocean, Lakes & Coastal Regions	
Estimate Water Depth	Several reflected bands (shorter wavelengthe blue and green are better) plus NIR for land-water boundary
Detect Oil Sheens	Short wavelengths are better UV or natural color composite will work
Detect Oil Slicks	Either thermal band and a UV to weed out false thermal signatures, visible bands may sometimes substitute for UV.
Detect Surfactants on Water	Several from each class, reflected, mixed & thermal
Estimate Water Surface Temperature	Either thermal band
Map Underwater Features	Several reflected band plus NIR for land-water boundary
Measure Ocean Surface Color	All reflected bands
Measure Ocean Waves	Resolution is important for this task
Detect Ship Wakes	Thermal wake persisit much longer than the visible wake
Classify Ship Wakes	Resolution is important for this task
Meterology & Climatology	
Classify Clouds	The PAN band detect bright clouds and structure, several reflected bands either thermal bands to classify thickness.
Discriminate Clouds from Land	The PAN band or reflected band to detect bright clouds, and either thermal band to disciminate from land.
Discriminate Clouds from Sea or Water	The PAN band or reflected band to detect bright clouds, and SWIR and either thermal band to disciminate from snow/ice backgroun
Discriminate Clouds from Snow & Ice	The PAN band or reflected band to detect bright clouds, and SWIR and either thermal band to disciminate from water background.
Damage Assessment	
Detect Fire	Either thermal band, SWIR for very hot fires, Red often out performs SWIR
Detect Smoke	Any and all reflected bands
Discriminate Smoke from Clouds	Reflected bands plus a SWIR
Condition of Roads, Bridges & Airfields	Resolution is important for this task
Map Extent of Fire Damage	As many bands as practical
Map Extent of Flood Damage	As many bands as practical
Map Extent of Storm Damage	As many bands as practical
Map Extent of Earthquake orLandslide Damage	As many bands as practical

Table 5: Synthetic Aperture Radar Applications

	Polarization			Radar Reflectivity					
				Ku-Band	X-Band	C-Band	S-Band	L-Band	P-Band
Information Elements	HH	HV/VH	VV	1.67-2.75 cm	2.75-5.21 cm	5.21-7.69 cm	7.7-19.4 cm	19.4-77 cm	77- 133 cm
Land Surface									
Visual Spatial Analysis				ALT	PRI	PRI	ALT	SUB	SUB
Detect Man Made Features				ANY	ANY	ANY	ANY	ANY	ANY
RCS Analysis				ANY	ANY	ANY	ANY	ANY	ANY
Phase Analysis				ANY	ANY	ANY	ANY	ANY	ANY
Multipath Analysis				ANY	ANY	ANY	ANY	ANY	ANY
Folliage Penetration				SUB	SUB	ALT	ALT	PRI	PRI
Dry Soil Penetration				SUB	SUB	ALT	ALT	PRI	PRI
Material Penetration				SUB	SUB	ALT	ALT	PRI	PRI
Topography by SAR Stereo				ALT	ALT	ALT	ALT	ALT	ALT
Topography by Radar Interferometry				ALT	ALT	ALT	ALT	ALT	ALT
Vegetation Classification			X	PRI	PRI	PRI	ALT	SUB	SUB
Ice & Snow									
Classify Snow by moisture Content				SUB	SUB	ALT	ALT	PRI	PRI
Discriminate Ice From Open Water				PRI	PRI	ALT	ALT	SUB	SUB
Discriminate First Year from Muliyear Ice				SUB	SUB	ALT	ALT	PRI	PRI
Oceans, Lakes & Coastal Regions									
Detect & Measure Oil Slicks	X			PRI	PRI	ALT	ALT	SUB	SUB
Ship Wake Analysis	X			ANY	ANY	ANY	ANY	ANY	ANY
Surface Wave Analysis	X			ANY	ANY	ANY	ANY	ANY	ANY
Estimate WInd Velocity & Direction Over Water	X			ANY	ANY	ANY	ANY	ANY	ANY
Estimate Sea State				ANY	ANY	ANY	ANY	ANY	ANY
Damage Assessment									
Radar Change Detection				ALT	ALT	ALT	ALT	ALT	ALT
Assess Condition of Powerlines				ANY	ANY	ANY	ANY	ANY	ANY
Assess Condition of Roads Rails & Bridges				PRI	PRI	ALT	ALT	SUB	SUB
Assess Condition Dams & Levies				ANY	ANY	ANY	ANY	ANY	ANY
Assess Condition of Comm. Antennas			X	ANY	ANY	ANY	ANY	ANY	ANY
Assess Condition of Airfields				ANY	ANY	ANY	ANY	ANY	ANY
Assess Extent of Flood				ANY	ANY	ANY	ANY	ANY	ANY

Table 5: Synthetic Aperture Radar Applications (continued)

Information Elements	Remarks
Land Surface	
Visual Spatial Analysis	Shorter wavelengths are generally better.
Detect Man Made Features	Any wavelength
RCS Analysis	Requires calibration
Phase Analysis	Requires Complex Image
Multipath Analysis	Requires sensor models
Folliage Penetration	Longer wavelegths are better
Dry Soil Penetration	Longer wavelegths are better
Material Penetration	Longer wavelegths are better
Topography by SAR Stereo	Shorter wavelengths are better.
Topography by Radar Interferometry	Requires Complex Image, Longer wavelegths are easier
Vegetation Classification	Shorter wavelengths are better.
Ice & Snow	
Classify Snow by moisture Content	Longer wavelegths are better
Discriminate Ice From Open Water	Shorter wavelengths are better.
Discriminate First Year from Muliyear Ice	Longer wavelegths are better
Oceans, Lakes & Coastal Regions	
Detect & Measure Oil Slicks	Shorter wavelengths are better.
Ship Wake Analysis	Any wavelength
Surface Wave Analysis	Any wavelength
Estimate WInd Velocity & Direction Over Water	Any wavelength
Estimate Sea State	Any wavelength
Damage Assessment	
Radar Change Detection	Requires Complex Image
Assess Condition of Powerlines	Any wavelength
Assess Condition of Roads Rails & Bridges	Shorter wavelengths are better.
Assess Condition Dams & Levies	Any wavelength
Assess Condition of Comm. Antennas	Any wavelength
Assess Condition of Airfields	Any wavelength
Assess Extent of Flood	Any wavelength

Table 6: Passive Microwave Radiometer Applications

Information Elements	Brightness Temperature									
	L-Band 1.4 GHz	**L-Band** 3.0 GHz	**C-Band** 6.6 GHz	**X-Band** 10.7 GHz	**Ku-Band** 18.0 GHz	**K-Band** 21.0 Ghz	**Ka-Band** 37.0 GHz	**V-Band** 55.0 GHz	**W-Band** 90.0 GHz	**W-Band** 183.0 GHz
Meterology & Climatology										
Temperature Profile							CON	PRI		
Water Vapor Profile					CON	PRI	CON			ESS
Water Vapor Profile (Non-tropical)									CON	PRI
Liquid Water Abundance/Rain Rate		CON	CON	CON	ESS	ESS	PRI	CON	ESS	
Cloud Thickness								PRI		
Cloud Temperature										
Sea Surface Temperature	CON	ESS	PRI	CON	ESS	ESS	ESS		ESS	
Sea Surface Wind Speed	ESS	CON	ESS	PRI			ESS			
Sea Surface Wind Speed (No precipitation)					ESS	ESS	PRI			
Severe Storms										
Temperature Profile							CON	PRI		
Water Vapor Profile						ESS	PRI	ESS		ESS
Water Vapor Profile (Non-tropical)									ESS	PRI
Liquid Water Abundance/Rain Rate		CON	CON	CON	ESS	ESS	PRI	CON	ESS	
Sea Surface Temperature	CON	ESS	PRI	CON	ESS	CON	ESS			
Sea Surface Wind Speed					ESS	ESS	PRI		ESS	
Sea Surface Wind Speed (No precipitation)	ESS	CON	ESS	PRI			ESS			
Ocean Surface										
Sea Surface Wind Speed	ESS	CON	ESS	PRI			ESS			
Sea Surface Wind Speed (No precipitation)	CON	CON	PRI	CON	ESS	CON	ESS			
Sea Surface Temperature	CON	CON	PRI	CON	ESS	CON	ESS			
Salinity	PRI	CON	ESS	CON	ESS		ESS			
Oil Slicks	CON	CON	ESS		ESS		PRI			
Land Survey										
Soil Moisture Content	PRI		ESS							
Soil Moisture Content	CON		PRI			CON				
Snow Cover Classification		CON	ESS		ESS		PRI		ESS	
Sea & Ice										
Sea Ice Concentration					ESS		PRI		ESS	
Sea Ice Classification		CON	CON	ESS	ESS		PRI		CON	
Land Ice Concentration		CON	CON	ESS	ESS		PRI		CON	

Adapted from Staelin & Rosenkrantz 1978

Spatial resolution and area coverage must often be traded against one another. This is due to limitation in the rate at which data can be transmitted. Adding bands is cheaper in this respect than increasing resolution or area coverage. Doubling the resolution or the area coverage quadruples the data to be transmitted. Adding a band only increases the data by a fraction.

Some general applications imply a need for certain minimum resolution or area coverage, for example:

Meteorology
- Extremely large area of coverage, up to the entire disk of the earth.
- Low resolution is acceptable from 10 to 1000 km.
- Radiometric accuracy is important.

Oceans
- Large areas are important
- Resolution from 100 m to 30 km are useful
- Sea ice and wave measurements require higher resolution 10 to 50 m.

Land Mineral Resources
- Large area coverage is important
- Multi sensor approach is very important
- Thermal bands are very useful
- Multi-seasonal coverage is important
- Multi-temporal and repeat coverage is important

Agricultural Assessments and Land Use:
- 10 to 30 m resolution
- Multispectral is very important
- Seasonal coverage is critical
- Large areas are preferred but mosaics are often acceptable

Urban and Topographic mapping
- 10 m. resolution or better
- Area coverage is secondary
- Stereo is essential for topography.

Military Reconnaissance
- Military requirements are broken down into Target Categories and level of analysis in Table 7 below (resolutions are in meters):[6]

[6] Based on combined U.S. and NATO requirements as set forth in RADC-TR-90-370, "Imagery Interpretation Requirements for Reconnaissance Systems." Original resolution requirements stated in feet were converted to meters for consistency.

Table 7: Military Reconnaissance Resolution Requirements

Target Categories	General Detection	Classify-Type	Identify Variants	Characterize
Aircraft	5	2	1	0.3
Airfield Facilities	7	5	3	0.3
Artillery & Rockets	1	0.5	0.1	0.1
Bridges	7	3	1-2	0.3
Coast & Landing Beaches	15-30	3	1-2	0.3
Command & HQ	3	1-3	1	0.1
Land Mine fields	3	2-7	1	0.1
Missile Sites	3	2	1	0.3
Nuclear Weapons	3	2	0.3	0.1
Ports and Harbors	30	7-15	7	2-3
Radar Site	3	1	0.3	0.1
Communications Sites	3	1-2	0.3	0.1
Rail Roads & Yards	15-30	3-15	1-7	1
Roads	7-10	3-7	1-2	1
Supply Depots	3-5	1-2	0.3	0.1
Surface Ships	8-15	3	0.6	0.3
Surfaced Submarines	8-30	5-7	1	1
Terrain	N/A	100	3	3
Troop Convoys & Camps	7	2-3	1	0.3
Urban Areas	60-100	15-30	3	0.5
Military Vehicles	3	1	0.3	0.1

National level imagery requirements are compiled by various users within the intelligence community as Imagery Requirements Objectives Lists (IROLs). These lists are classified and are integrated at the national level as the Imagery Requirements Objectives File (IROF). IROF resolution requirements are listed according to the National Image Interpretation Rating Scale (NIIRS). While NIIRS is actually a composite scale based on several image quality parameters, if one assumes a clear sky and no sensor malfunctions it can be related to resolution as in Table 8.

Table 8: NIIRS Related to GSD[7]

NIIRS	1	2	3	4	5	6	7	8	9
GSD In meters	9.14	4.57	2.44	1.22	0.76	0.41	0.20	0.10	0.05
GSD In Ft.	30.00	15.00	8.00	4.00	2.50	1.33	0.67	0.33	0.17

[7] The NIIRS scale applies only to optical imagery. Scales for other sensor types are still classified.

5.5 Platforms and Sensors. This study considered two classes of platforms, satellites and aircraft.[8] A platform may carry a number of different sensors. Landsat carries both the Thematic Mapper and Multispectral Scanner. DMSP carries a suite of at least ten different sensors.

A list of platforms was created listing platforms by name, abbreviation and type (acft. or sat.). The table also includes, Nationality, Operating Agency, Orbit Type, Apogee, Perigee, Inclination, Revisit Interval in days for satellites (nadir and off-nadir), date of initial operational capability (IOC) and end of mission dates for completed discontinued missions.[9]

The platforms are linked to a sensor table which list all the sensors for each platform by name, abbreviation and sensor type (MSI, SAR, MWR etc.).

Sensors are linked to a sensor band table which lists:

- Band name (a unique name for each band).
- Band type (using the names as in Tables 4 and 5).
- Cut on and Cut off wavelengths (in nm) for optical and MSI systems.
- Center Frequency (in GHz) for Microwave systems.
- Band width (as text for all sensor types, for SARs this indicates multiple resolution modes).
- Resolution (in meters) nominal best possible.[10]
- Swath Width (in km) at the stated resolution.

Using the platform, sensor and band tables it is possible to search for a variety of combinations of characteristics. Examples are provided in the appendices.

Appendix A: All satellite sensors (platform type = SAT).[11]

---

[8] The U.S. Space Shuttle is problematic in this regard. It is of limited duration, like an aircraft, but its sensors perform like those of a satellite, because of its altitude and orbital constraints. For the purpose of this study it has been classified as a satellite but may deserve its own classification.

[9] Revisit interval is based on the maximum time between repeat coverage at the equator. For polar orbiting satellites the interval decreases with latitude. Some sensors (such as ERS-1) have variable orbits and so have variable revisit intervals. Some sensors offer off nadir viewing capability. For these sensors revisit interval represents the ability to access an area without necessarily repeating the orbit.

[10] For most sensors the resolution value is the GSD. For some radiometers a GSD was computed based on IFOV and orbital altitude. Some sensors offer variable resolution. The best possible resolution is listed. Landsat TM's nominal resolution is 30 meters although some sites can process it to 27.5 m. Resolutions for SARs are the best impulse response (IPR). Limb sounder resolutions are in the vertical dimesion, all others are ground resolutions ate nadir at perigee.

[11] Some sensors have no resolution value. It is either not available or is not applicable to the sensor (such as an HF noise monitor). Appendix A lists all sensors for which resolution is not zero or blank.

Appendix B: SAR satellite sensors (platform type = SAT and sensor type = SAR)

Appendix C: Satellite sensors with resolution better or equal to LANDSAT Thematic Mapper (RESMETER <= 30). Notice that the LWIR band for Landsat is not listed because its GSD is 120 meters. ADEOS, Eyeglass, IRS-C/D, RadarSat, and WorldView are not yet operational (note the IOC dates).

The last query is probably the most instructive because many government users are familiar with Landsat and SPOT.

The band types in these tables can be related to the generic band types used by Tables 3,4 and 5.

For example, if you wanted a list of sensors with potential for producing vegetation index, (from Table 6), you could search Table 6 for useful bands (red and NIR) and then query the sensor band and table for all sensors with both a red and NIR band.

6.0 Database Development. The data compiled in the course of this study were initially entered into flat files using Microsoft Excel. Once the relational nature of the data became apparent these files were converted into FoxPro database files.

Foxpro 2.5 was chosen for several reasons.

- It was inexpensive
- It offered cross platform operation on both IBM and Macintosh PC's
- It is uses Standard Query Language (SQL) which would permit files to be transferred to another SQL databases, such as oracle.
- It offered the potential for generation of forms and reports with which to customize a user interface.

7.0 Conclusions and Recommendations.

7.1 Conclusions. The data gathered in this study, while by no means complete, is adequate to permit a fairly rigorous examination of sensor utility for a variety of tasks. The basic data structure used seems sound. The answers produced by queries on the data base make sense.

While FoxPro 2.5 is a fairly powerful database program, it is not a pure SQL database. It uses a mixture of SQL and DBASE commands. While the data structures and tables are easily transferable to other platforms the user interface is not. Microsoft is planning a UNIX version of FoxPro but no delivery date has been announced.

While FoxPro has some impressive query capabilities and customization options, it is not for the novice user. Formulating complex queries is not difficult, but it requires the user to have a great deal of knowledge about the data base. FoxPro had its origins under DOS. In order to maintain DOS cross-platform compatibility it enforces DOS-like limitations on file names and adds file extensions. This leads to some rather arcane file and record names which in turn make navigating the database difficult for a new user.

In the opinion of the programmer who worked with it, FoxPro offers no significant advantages over ORACLE nor any other relational database already available for UNIX.

7.2 Recommendations. The current database tables and link files should be transferred to a UNIX based system and incorporated into the RDAST database. Some additional data fields have been identified as potentially useful.

In the User tables:

- Fax Number, this field has been added some numbers are known, but many would have to be confirmed.
  - Point of Contact, many are already known, putting them in a database would require compliance with the Privacy Act.
  - Internet/EMail address, these would have to be researched.

In the Sensor Band Table:

- Sensitivity, (a value for noise equivalent power, temperature or reflectivity). This field was omitted because the values are not widely published for most sensors. Locating this data would require additional work.

In the Sensor Table:

- Levels of Processing Available, such as radiometric corrections, geometric corrections, geocoding etc. This data is available for SPOT and Landsat and some NOAA satellites, but is not listed for most other sensors.

The sensor tables will be ported to the Unix system. A global query on the Users table and on the Sensor tables will be will be converted to Filemaker files to permit browsing by non-relational database programs on PC's.

Appendix A: Database Listing of all Satellite Sensors

ADEOS — **Advanced Earth Observing Satellite**

Agency: NASDA | Country: JAPAN | loc: 01/01/96 | Eom: / /

Orbit: SUN SYNCHRONOUS | Apogee 800 km Perigee 800 km | Incl.: 98.6° | Repeat: 41 days

AVNIR — **Advanced Visible & Near Infrared Radiometer** — MSI

Stereo Capability: Cross Track | Off Axis Repeat: 1 Day

Band(s)					Resolution	Swath
AVNIR-1	BLUEGREEN	0.420	0.520um		16.0 m	80 km
AVNIR-2	GREEN	0.520	0.600um		16.0 m	80 km
AVNIR-3	RED	0.630	0.690um		16.0 m	80 km
AVNIR-4	NIR	0.760	0.860um		16.0 m	80 km
AVNIR-PAN	VISIBLE	0.400	0.700um		8.0 m	80 km

ILAS — **Improved Limb Atmospheric Spectrometer** — SPEC

Stereo Capability: | Off Axis Repeat:

Band(s)					Resolution	Swath
ILAS-1	NIR	0.753	0.784um		500000.0 m	3000 km
ILAS-2	H2OABS	6.210	11.770um		500000.0 m	3000 km

IMG — **Interferometric Monitor for Greenhouse Gases** — RAD

Stereo Capability: | Off Axis Repeat:

Band(s)					Resolution	Swath
IMG-1	H2OABS	3.300	4.300um		8000.0 m	8 km
IMG-2	CO2ABS	4.000	5.000um		8000.0 m	8 km
IMG-3	H2OABS	5.000	14.000um		8000.0 m	8 km

NSCAT — **NASA Scatterometer** — SCAT

Stereo Capability: | Off Axis Repeat:

Band(s)					Resolution	Swath
NSCAT	KU-BAND	14.000	GHz		50000.0 m	1200 km

OCTS — **Ocean Color & Temperature Scanner** — MSI

Stereo Capability: | Off Axis Repeat:

Band(s)					Resolution	Swath
OCTS-01	BLUE	0.400	0.450um		700.0 m	1400 km
OCTS-02	BLUEGREEN	0.450	0.500um		700.0 m	1400 km
OCTS-03	GREEN	0.500	0.550um		700.0 m	1400 km
OCTS-04	GREEN	0.550	0.600um		700.0 m	1400 km
OCTS-05	RED	0.600	0.650um		700.0 m	1400 km
OCTS-06	RED	0.650	0.700um		700.0 m	1400 km
OCTS-07	NIR	0.700	0.900um		700.0 m	1400 km
OCTS-08	NIR	0.900	1.100um		700.0 m	1400 km
OCTS-09	MWIR	3.000	5.000um		700.0 m	1400 km
OCTS-10	LWIR	8.500	10.500um		700.0 m	1400 km
OCTS-11	LWIR	10.500	12.600um		700.0 m	1400 km
OCTS-12	LWIR	8.500	14.000um		700.0 m	1400 km

POLDER — **Polarization and Directionality of Earth's Reflectances** — RAD

Stereo Capability: | Off Axis Repeat:

Band(s)					Resolution	Swath
POL-1	BLUEGREEN	0.433	0.463um		6000.0 m	2200 km
POL-1P	BLUEGREEN	0.433	0.463um	Polarized	6000.0 m	2200 km
POL-2	GREEN	0.480	0.500um		6000.0 m	2200 km
POL-3	GREEN	0.555	0.575um		6000.0 m	2200 km
POL-4P	RED	0.660	0.690um	Polarized	6000.0 m	2200 km
POL-5	NIR	0.753	0.773um		6000.0 m	2200 km
POL-6	NIR	0.745	0.785um		6000.0 m	2200 km
POL-7P	NIR	0.845	0.885um	Polarized	6000.0 m	2200 km
POL-8	NIR	0.900	0.920um		6000.0 m	2200 km

TOMS — **Total Ozone Mapping Spectrometer** — SPEC

Stereo Capability: — Off Axis Repeat:

Band(s)				Resolution	Swath
TOMS-1	UV	0.300 -	0.308 um	40000.0 m	2795 km
TOMS-2	UV	0.310 -	0.315 um	40000.0 m	2795 km
TOMS-3	UV	0.315 -	0.320 um	40000.0 m	2795 km
TOMS-4	UV	0.320 -	0.330 um	40000.0 m	2795 km
TOMS-5	UV	0.330 -	0.335 um	40000.0 m	2795 km
TOMS-6	UV	0.355 -	0.365 um	40000.0 m	2795 km

ALMAZ-1 — **ALMAZ-1 S/C SARSAT**

Agency: RSA — Country: RUSSIA — loc: 03/31/91 — Eom: / /

Orbit: POLAR — Apogee 300 km Perigee 360 km Incl.: 72.7° Repeat: n/a

MAZ-1 — **ALMAZ-1, Synthetic Aperture Radar** — SAR

Stereo Capability: — Off Axis Repeat:

Band(s)				Resolution	Swath
S-SAR	S-BAND	3.125 -	GHz	10.0 m	40 km

UHF-RAD — **ALMAZ-1, UHF Radiometer** — MWR

Stereo Capability: — Off Axis Repeat:

Band(s)				Resolution	Swath
MAZ-1	Q-BAND	37.500 -	GHz	5000.0 m	30 km
MAZ-2	X-BAND	6.000 -	GHz	5000.0 m	30 km
MAZ-3	K-BAND	25.000 -	GHz	5000.0 m	30 km
MAZ-3	K-Band	27.200 -	GHz	5000.0 m	30 km
MAZ-5	K-BAND	21.900 -	GHz	5000.0 m	30 km

ALMAZ-1B — **ALMAZ-1B, Earth Remote Sensing Satellite**

Agency: RSA — Country: RUSSIA — loc: 12/31/96 — Eom: / /

Orbit: POLAR — Apogee 400 km Perigee 400 km Incl.: 73.0° Repeat: Variable

BALKAN-2 — **Balkan-2 Lidar** — LIDAR

Stereo Capability: — Off Axis Repeat:

Band(s)					Resolution	Swath
BAL-1	GREEN	0.532 -	um	ND YAG	10.0 m	140 km

MSU-E — **Multispectral Scanner of High Resolution** — MSI

Stereo Capability: — Off Axis Repeat:

Band(s)				Resolution	Swath
MSU-E-1	GREEN	0.500 -	0.600 um	33.0 m	80 km
MSU-E-2	RED	0.600 -	0.700 um	33.0 m	80 km
MSU-E-3	NIR	0.800 -	0.900 um	33.0 m	80 km

MSU-SK — **Multispectral Scanner of Mod Conical Scan** — MSI

Stereo Capability: — Off Axis Repeat:

Band(s)				Resolution	Swath
MSU-SK-1	GREEN	0.500 -	0.600 um	170.0 m	600 km
MSU-SK-2	RED	0.600 -	0.700 um	170.0 m	600 km
MSU-SK-3	NIR	0.700 -	0.800 um	170.0 m	600 km
MSU-SK-4	NIR	0.800 -	1.100 um	170.0 m	600 km
MSU-SK-5	LWIR	10.400 -	12.600 um	600.0 m	600 km

OSSI — **Optronic Sensor for Stereo Imagery** — MSI

Stereo Capability: Fwd/Aft — Off Axis Repeat:

Band(s)				Resolution	Swath
OSSI-1	GREEN	0.500 -	0.600 um	4.0 m	80 km
OSSI-2	RED	0.600 -	0.700 um	4.0 m	80 km
OSSI-2	NIR	0.700 -	0.800 um	4.0 m	80 km
OSSI-PAN	VNIR	0.580 -	0.800 um	2.5 m	80 km

SAR-10 **ALMAZ-1B, Synthetic Aperture S-Band Radar** SAR

Stereo Capability: Off Axis Repeat:

Band(s)						Resolution	Swath
SAR-10	S-BAND	3.130	-	GHz	VV,HH,	15.0 m	170 km
SAR-10	S-BAND	3.130	-	GHz	VV,HH,	5.0 m	55 km
SAR-10	S-BAND	3.130	-	GHz	VV,HH,	15.0 m	70 km

SAR-3 **ALMAZ-1B, Synthetic Aperture X-Band Radar** SAR

Stereo Capability: Off Axis Repeat:

Band(s)						Resolution	Swath
SAR-3	X-BAND	8.600	-	GHz	VV	5.0 m	35 km

SAR-70 **ALMAZ-1B, Synthetic Aperture P-Band Radar** SAR

Stereo Capability: Off Axis Repeat:

Band(s)						Resolution	Swath
SAR-70	P-BAND	43.00	-	MHz	VV,HH,	22.0 m	170 km

SLR-3 **ALMAZ-1B, Real Aperture Radar** SLR

Stereo Capability: Off Axis Repeat:

Band(s)						Resolution	Swath
SLR-3	X-BAND	8.600	-	GHz	VV	1200.0 m	450 km

SROM **Spectroradiometer for Ocean Monitoring** MSI

Stereo Capability: Off Axis Repeat:

Band(s)					Resolution	Swath
SROM-1	BLUE	0.405	-	0.422um	600.0 m	2200 km
SROM-10	LWIR	10.500	-	11.500um	600.0 m	2200 km
SROM-2	BLUEGREEN	0.433	-	0.453um	600.0 m	2200 km
SROM-3	BLUEGREEN	0.480	-	0.500um	600.0 m	2200 km
SROM-4	GREEN	0.521	-	0.530um	600.0 m	2200 km
SROM-5	GREEN	0.555	-	0.575um	600.0 m	2200 km
SROM-6	RED	0.655	-	0.675um	600.0 m	2200 km
SROM-7	NIR	0.745	-	0.785um	600.0 m	2200 km
SROM-8	NIR	0.843	-	0.884um	600.0 m	2200 km
SROM-9	MWIR	3.600	-	3.900um	600.0 m	2200 km

CBERS **China-Brazil Earth Resources Satellite**

Agency: INPE CSA Country: CHINA BRAZIL Ioc: 12/31/96 Eom: / /

Orbit: SUN SYNCHRONOUS Apogee 778 km Perigee 778km Incl.: 98.5° Repeat: 26 Days

CCD **Charge-Coupled Device Camera** MSI

Stereo Capability: Cross Track Off Axis Repeat: 3 Days

Band(s)					Resolution	Swath
CCD-1	VISIBLE	0.510	-	0.730um	19.5 m	120 km
CCD-2	BLUEGREEN	0.450	-	0.520um	19.5 m	120 km
CCD-3	GREEN	0.520	-	0.590um	19.5 m	120 km
CCD-4	RED	0.630	-	0.690um	19.5 m	120 km
CCD-5	NIR	0.770	-	0.890um	19.5 m	120 km

IR-MSS **Infrared Multispectral Scanner** MSI

Stereo Capability: Cross Track Off Axis Repeat: 3 Days

Band(s)					Resolution	Swath
IR-MSS-1	VISNIR	0.500	-	1.100um	78.0 m	120 km
IR-MSS-2	SWIR	1.550	-	1.750um	78.0 m	120 km
IR-MSS-3	SWIR	2.080	-	2.350um	78.0 m	120 km
IR-MSS-4	LWIR	10.400	-	12.500um	156.0 m	120 km

WFI **Wide Field Imager** MSI

Stereo Capability: Off Axis Repeat:

Band(s)					Resolution	Swath
WFI-1	RED	0.630	-	0.690um	260.0 m	856 km
WFI-2	NIR	0.770	-	0.890um	260.0 m	856 km

COSMOS1870 — **COSMOS 1870, ALMAZ Prototype, USSR**

Agency: RSA | Country: RUSSIA | loc: 07/25/87 | Eom:07/30/89

Orbit:CIRCULAR | Apogee 275 km | Perigee 275km | Incl.: 73.0° | Repeat: n/a

S-Band SAR — **COSMOS 1870, Synthetic Aperture Radar** — SAR

Stereo Capability: | Off Axis Repeat:

Band(s)					Resolution	Swath
SAR-1870	S-BAND	3.125	-	GHz VV	25.0 m	20 km

CRESS — **Civilian Remote Sensing Satellite**

Agency: LOCKHEED | Country: USA | loc: / / | Eom: / /

Orbit:SUN SYNCHRONOUS | Apogee 0 km | Perigee 0km | Incl.: 98.0° | Repeat: 247

CRSS-1 — **CRSS Stereo Sensor** — E-O

Stereo Capability: Fwd/Aft | Off Axis Repeat:

Band(s)					Resolution	Swath
CRSS-1	VISIBLE	0.450	-	0.800um Stereo	1.0 m	0 km

DMSP — **Defense Meteorological Satellite Program 5-D**

Agency: DOD | Country: USA | loc: 09/11/76 | Eom: / /

Orbit:SUN SYNCHRONOUS | Apogee 850 km | Perigee 850km | Incl.: 99.0° | Repeat: 16 Days

OLS — **Operational Linescan System** — RAD

Stereo Capability: | Off Axis Repeat:

Band(s)					Resolution	Swath
OLS-1	VISNIR	0.410	-	1.100um	550.0 m	2925 km
OLS-2	LWIR	10.500	-	12.600um	550.0 m	2925 km

SSC — **Special Sensor C (Snow-Cloud Discriminator)** — RAD

Stereo Capability: | Off Axis Repeat:

Band(s)					Resolution	Swath
SSC	NIR	1.510	-	1.630um	12500.0 m	600 km

SSD — **Special Sensor D (Atmospheric Density Sensor)** — RAD

Stereo Capability: | Off Axis Repeat:

Band(s)					Resolution	Swath
SSD	UV	0.200	-	0.400um	36000.0 m	1500 km

SSH — **Special Sensor H (Humidity, Temperature Ozone Sounder)** — RAD

Stereo Capability: | Off Axis Repeat:

Band(s)					Resolution	Swath
SSH 1	NIR	0.900	-	1.100um	39000.0 m	2000 km
SSH 2	LWIR	10.500	-	12.600um	39000.0 m	2000 km
SSH 3-8	CO2ABS	15.000	-	22.000um	39000.0 m	2000 km
SSH 9-16	H2OABS	22.000	-	30.000um	39000.0 m	2000 km

SSM/I — **Special Sensor M/I(Microwave Environmental Sensor)** — MWR

Stereo Capability: | Off Axis Repeat:

Band(s)					Resolution	Swath
SSMI-1	K-BAND	19.350	-	GHz V	50000.0 m	1400 km
SSMI-2	K-BAND	22.230	-	GHz V	50000.0 m	1400 km
SSMI-3	Q-BAND	37.000	-	GHz V	25000.0 m	1400 km
SSMI-4	W-BAND	85.500	-	GHz V	25000.0 m	1400 km
SSMI-5	W-BAND	85.500	-	GHz H	25000.0 m	1400 km
SSMI-6	Q-BAND	37.000	-	GHz H	25000.0 m	1400 km
SSMI-7	K-BAND	19.350	-	GHz H	50000.0 m	1400 km

SSM/T — **Special Sensor M/T (Passive Microwave Temperature Sounder)** — MWR

Stereo Capability: | Off Axis Repeat:

Band(s)					Resolution	Swath
SSMT-1	V-BAND	50.500	-	GHz	175000.0 m	1050 km

SSMT-2	V-BAND	53.200 -	GHz		175000.0 m	1050 km
SSMT-3	V-BAND	54.350 -	GHz		175000.0 m	1050 km
SSMT-4	V-BAND	54.900 -	GHz		175000.0 m	1050 km
SSMT-5	W-BAND	58.825 -	GHz		175000.0 m	1050 km
SSMT-6	W-BAND	58.400 -	GHz		175000.0 m	1050 km
SSMT-7	W-BAND	59.400 -	GHz		175000.0 m	1050 km

EOS AEROSOL — **Earth Observation System, Aerosol Mission**

Agency: NASA | Country: USA | loc: 10/10/00 | Eom: / /

Orbit: CIRCULAR | Apogee 705 km Perigee 705 km | Incl.: 57.0° | Repeat:

EOSP — **Earth Observing Scanning Polarimeter** — RAD

Stereo Capability: | Off Axis Repeat:

Band(s)					Resolution	Swath
EOSP 1-12	VNIR	0.410 -	2.250 um	12 Polarized	10000.0 m	13000 km

SAGE III — **Stratospheric Aerosol & Gas Experiment III** — RAD

Stereo Capability: | Off Axis Repeat:

Band(s)					Resolution	Swath
SAGE 1-9	VNIR	0.290 -	1.550 um	Vertical res	2000.0 m	0 km

EOS ALT-1 — **Earth Observation System, Altimeter Mission**

Agency: NASA | Country: USA | loc: 01/01/02 | Eom: / /

Orbit: TBD | Apogee 0 km Perigee 0 km | Incl.: 0.0° | Repeat:

EOS-ALT — **EOS Altimeter** — ALT

Stereo Capability: | Off Axis Repeat:

Band(s)					Resolution	Swath
EOS-ALT-1	KU-BAND	13.600 -	GHz	H	25000.0 m	2 km
EOS-ALT-2	C-BAND	5.300 -	GHz	H	25000.0 m	2 km

EOS AM-1 — **Earth Observation System, Ante Meridian Mission**

Agency: NASA | Country: USA | loc: 01/01/98 | Eom: / /

Orbit: SUN SYNCHRONOUS | Apogee 705 km Perigee 705 km | Incl.: 99.0° | Repeat: 49 DAYS

ASTER — **Advanced Spaceborne Thermal Emission & Radiation Radiometer** — RAD

Stereo Capability: Fwd/Aft | Off Axis Repeat: 5 Days

Band(s)					Resolution	Swath
ASTER-LWIR	LWIR	8.000 -	14.000 um	5 Bands	90.0 m	0 km
ASTER-SWIR	SWIR	1.600 -	2.500 um	6 Bands	30.0 m	0 km
ASTER-VNIR	VNIR	0.500 -	0.900 um	3 Bands	15.0 m	0 km

CERES — **Clouds & Earth's Radiant Energy System** — RAD

Stereo Capability: | Off Axis Repeat:

Band(s)					Resolution	Swath
CERES-1	VNIR LWIR	0.300 -	50.000 um	Total Radiance	21000.0 m	13000 km
CERES-2	VNIR MWIR	0.300 -	5.000 um	Shortwave	21000.0 m	13000 km
CERES-3	LWIR	8.000 -	14.000 um	Longwave	21000.0 m	13000 km

MISR — **Multi-angle Imaging Spectrometer** — MSI

Stereo Capability: | Off Axis Repeat:

Band(s)				Resolution	Swath
MISR-1	BLUEGREEN	0.423 -	0.463 um	240.0 m	356 km
MISR-2	GREEN	0.535 -	0.575 um	240.0 m	356 km
MISR-3	RED	0.650 -	0.690 um	240.0 m	356 km
MISR-4	NIR	0.845 -	0.885 um	240.0 m	356 km

MODIS — **Moderate Resolution Imaging Spectrometer** — RAD

Stereo Capability: | Off Axis Repeat:

Band(s)					Resolution	Swath
MODIS 1-36	VNIR LWIR	0.400 -	15.000 um	2-29 selectable	250.0 m	0 km

MOPITT — **Measurement Of Pollution In The Troposphere** — SPEC

Stereo Capability: Off Axis Repeat:

Band(s)					Resolution	Swath
MOPITT-1	SWIR	2.300 -	um		22000.0 m	640 km
MOPITT-2	SWIR	2.400 -	um		22000.0 m	640 km
MOPITT-3	MWIR	4.700 -	um		22000.0 m	640 km

EOS CHEM-1 — **Earth Observation System, Chemistry Mission**

Agency: NASA Country: USA Ioc: 01/01/02 Eom: / /

Orbit: SUN SYNCHRONOUS Apogee 0 km Perigee 0 km Incl.: 0.0° Repeat:

NSCAT II — **NASA "Stick" Scatterometer, NSCAT II "SeaWinds"** — SCAT

Stereo Capability: Off Axis Repeat:

Band(s)					Resolution	Swath
STIK-SCAT	KU-BAND	14.000 -	GHz		25000.0 m	600 km

SAGE III — **Stratospheric Aerosol & Gas Experiment III** — RAD

Stereo Capability: Off Axis Repeat:

Band(s)					Resolution	Swath
SAGE 1-9	VNIR	0.290 -	1.550 um	Vertical res	2000.0 m	0 km

EOS PM-1 — **Earth Observation System, Post Meridian Mission**

Agency: NASA Country: USA Ioc: 01/03/00 Eom: / /

Orbit: SUN SYNCHRONOUS Apogee 705 km Perigee 705 km Incl.: 99.0° Repeat:

AIRS — **Atmospheric InfraRed Sounder** — NADIR LIMB

Stereo Capability: Off Axis Repeat:

Band(s)					Resolution	Swath
AIRS 1-6	VNIR	0.400 -	1.700 um	6 Channels	13500.0 m	1650 km
AIRS-IR	MWRI LWIR	3.740 -	15.400 um	2300 Channels	13500.0 m	1650 km

AMSU-A — **Advanced Microwave Sounding Unit** — MWR

Stereo Capability: Off Axis Repeat:

Band(s)					Resolution	Swath
AMSU 1-15	SWIR LWIR	2.500 -	15.000 um	15 Channels	40000.0 m	0 km

CERES — **Clouds & Earth's Radiant Energy System** — RAD

Stereo Capability: Off Axis Repeat:

Band(s)					Resolution	Swath
CERES-1	VNIR LWIR	0.300 -	50.000 um	Total Radiance	21000.0 m	13000 km
CERES-2	VNIR MWIR	0.300 -	5.000 um	Shortwave	21000.0 m	13000 km
CERES-3	LWIR	8.000 -	14.000 um	Longwave	21000.0 m	13000 km

MHS — **Microwave Humidity Sounder** — MWR

Stereo Capability: Off Axis Repeat:

Band(s)					Resolution	Swath
MHS-1	W-BAND	89.000 -	GHz		13500.0 m	1650 km
MHS-2	W-BAND	166.000 -	GHz		13500.0 m	1650 km
MHS-3	W-BAND	183.300 -	GHz		13500.0 m	1650 km
MHS-4	W-BAND	183.300 -	GHz	H	13500.0 m	1650 km
MHS-5	W-BAND	183.300 -	GHz	V	13500.0 m	1650 km

MIMR — **Multi-frequency Imaging Mocrowave Radiometer** — MWR

Stereo Capability: Off Axis Repeat:

Band(s)					Resolution	Swath
MIMR-1	W-BAND	90.000 -	GHz	HV	4860.0 m	1400 km
MIMR-2	Q-BAND	36.500 -	GHz	HV	11620.0 m	1400 km
MIMR-3	K-BAND	23.800 -	GHz	HV	22300.0 m	1400 km
MIMR-4	X-BAND	10.650 -	GHz	HV	38600.0 m	1400 km
MIMR-5	X-BAND	6.800 -	GHz	HV	60300.0 m	1400 km

ERBS — Earth Radiation Budget Satellite

Agency: NASA | Country: USA | loc: 10/05/84 | Eom: / /

Orbit: CIRCULAR | Apogee 610 km Perigee 610km | Incl.: 57.0° | Repeat:

ERBE — Earth Radiation Budget Experiment — RAD

Stereo Capability: | Off Axis Repeat:

Band(s)					Resolution	Swath
ERBE 1-5	UV LWIR	0.200 -	50.000 um		1300000.0 m	130000 km
ERBE 6	UV MWIR	0.200 -	5.000 um		1300000.0 m	130000 km
ERBE 7	MWIR LWIR	5.000 -	50.000 um		1300000.0 m	130000 km
ERBE 8	UV LWIR	0.200 -	50.000 um		1300000.0 m	130000 km

SAGE III — Stratospheric Aerosol & Gas Experiment III — RAD

Stereo Capability: | Off Axis Repeat:

Band(s)					Resolution	Swath
SAGE 1-9	VNIR	0.290 -	1.550 um	Vertical res	2000.0 m	0 km

ERS-1 — European Remote Sensing Satellite 1

Agency: ESA | Country: EUROPEAN | loc: 07/17/91 | Eom: / /

Orbit: CIRCULAR | Apogee 610 km Perigee 610km | Incl.: 57.0° | Repeat: 35 Days

ATSR-IRR — Along Track Scanning Radiometer Infrared Radiometer — RAD

Stereo Capability: | Off Axis Repeat:

Band(s)				Resolution	Swath
ATSR IR-1	SWIR	1.600 -	um	1000.0 m	500 km
ATSR IR-2	MWIR	3.600 -	um	1000.0 m	500 km
ATSR IR-3	LWIR	11.000 -	um	1000.0 m	500 km
ATSR IR-4	LWIR	12.000 -	um	1000.0 m	500 km

ATSR-MWS — Along Track Scanning Radiometer Microwave Sounder — MWR

Stereo Capability: | Off Axis Repeat:

Band(s)				Resolution	Swath
ATSR MW-1	K-BAND	23.800 -	GHZ	20000.0 m	500 km
ATSR MW-1	KU-BAND	36.500 -	GHZ	20000.0 m	500 km

ERS-ALT — ERS Altimeter — ALT

Stereo Capability: | Off Axis Repeat:

Band(s)					Resolution	Swath
ERS-ALT	KU-BAND	13.700 -	GHz	VV	20.0 m	80 km

ERS-AMI — ERS Synthetic Aperture Radar — SAR

Stereo Capability: | Off Axis Repeat:

Band(s)					Resolution	Swath
ERS-AMI1	C-BAND	5.360 -	GHz	VV Image	30.0 m	100 km
ERS-AMI2	C-BAND	5.360 -	GHz	LV Wave	30.0 m	100 km

ERS-SCAT — ERS Scatterometer — SCAT

Stereo Capability: | Off Axis Repeat:

Band(s)					Resolution	Swath
ERS-SCAT	C-BAND	3.360 -	GHz	VV	25000.0 m	500 km

ERS-2 — European Remote Sensing Satellite 2

Agency: ESA | Country: EUROPEAN | loc: 12/31/94 | Eom: / /

Orbit: SUN SYNCHRONOUS | Apogee 824 km Perigee 824km | Incl.: 0.0° | Repeat:

AATSR-MWS — Advanced Along Track Scanning Radiometer Microwave Sounder — MWR

Stereo Capability: | Off Axis Repeat:

Band(s)				Resolution	Swath
ATSR MW-1	K-BAND	23.800 -	GHz	20000.0 m	500 km
ATSR MW-2	KU-BAND	36.500 -	GHz	20000.0 m	500 km

AATSR-VIRR Advanced Along Track Scanning Radiometer Vis-IR Radiometer RAD

Stereo Capability: Off Axis Repeat:

Band(s)						Resolution	Swath
AATSR-1	RED	0.65	-		um	500.0 m	500 km
AATSR-2	NIR	0.850	-		um	500.0 m	500 km
AATSR-3	H20 ABS	1.270	-		um	500.0 m	500 km
AATSR-4	SWIR	1.600	-		um	500.0 m	500 km
AATSR-IR-1	SWIR	1.600	-		um	1000.0 m	500 km
AATSR-IR-2	MWIR	3.600	-		um	1000.0 m	500 km
AATSR-IR-3	LWIR	11.000	-		um	1000.0 m	500 km
AATSR-IR-4	LWIR	12.000	-		um	1000.0 m	500 km

ERS-ALT ERS Altimeter ALT

Stereo Capability: Off Axis Repeat:

Band(s)						Resolution	Swath
ERS-ALT	KU-BAND	13.700	-		GHz VV	20.0 m	80 km

ERS-AMI ERS Synthetic Aperture Radar SAR

Stereo Capability: Off Axis Repeat:

Band(s)						Resolution	Swath
ERS-AMI1	C-BAND	5.360	-		GHz VV Image	30.0 m	100 km
ERS-AMI2	C-BAND	5.360	-		GHz LV Wave	30.0 m	100 km

ERS-SCAT ERS Scatterometer SCAT

Stereo Capability: Off Axis Repeat:

Band(s)						Resolution	Swath
ERS-SCAT	C-BAND	3.360	-		GHz VV	25000.0 m	500 km

GOME Global Ozone Monitoring Experiment SPEC

Stereo Capability: Off Axis Repeat:

Band(s)						Resolution	Swath
GOME-1	UV	0.240	-	0.295	um 512 Channels	40000.0 m	320 km
GOME-2	UV	0.290	-	0.405	um 1024 Channels	40000.0 m	320 km
GOME-3	BLUE	0.400	-	0.605	um 1024 Channels	40000.0 m	320 km
GOME-4	GREEN RED	0.590	-	0.790	um 1024 Channels	40000.0 m	320 km

Eyeglass Orbital Sciences & Eyeglass International

Agency: CIV Country: USA loc: 01/01/97 Eom: / /

Orbit: SUN SYNCHRONOUS Apogee 710 km Perigee 710 km Incl.: 0.0° Repeat: 197 Days

Eyeglass Eyeglass E-O

Stereo Capability: Fwd/Aft Off Axis Repeat: 2 Days

Band(s)						Resolution	Swath
EYEGLASS-P	VISIBLE	0.400	-	0.700	um	1.0 m	15 km

FENGYUN 1 Wind and Cloud Meteorological Satellites

Agency: SMA Country: CHINA loc: 10/07/88 Eom: / /

Orbit: SUN SYNCHRONOUS Apogee 900 km Perigee 900 km Incl.: 99.1° Repeat: Daily

VHRSR Very High Resolution Scanning Radiometer Vis & IR MSI

Stereo Capability: Off Axis Repeat:

Band(s)						Resolution	Swath
VHRSR-1	RED	0.580	-	0.680	um	1100.0 m	3235 km
VHRSR-2	NIR	0.725	-	1.100	um	1100.0 m	3235 km
VHRSR-3	BLUEGREEN	0.480	-	0.530	um	1100.0 m	3235 km
VHRSR-4	GREEN	0.530	-	0.580	um	1100.0 m	3235 km
VHRSR-5	LWIR	10.500	-	12.500	um	1100.0 m	3235 km

FENGYUN 2 Wind and Cloud Meteorological Satellites

Agency: SMA Country: CHINA loc: 12/31/94 Eom: / /

Orbit: GEOSTATIONARY 105E Apogee 37000 km Perigee 37000 km Incl.: 0.0° Repeat: Continuous

SCANRAD — **Scanning Radiometer** — RAD

Stereo Capability: Off Axis Repeat:

Band(s)					Resolution	Swath
SCANRAD-1	VINIR	0.550	-	1.050um	1430.0 m	6000 km
SCANRAD-2	LWIR	10.500	-	12.500um	5730.0 m	6000 km
SCANRAD-3	H2O ABS	6.300	-	7.600um	5730.0 m	6000 km

GMS — **Geostationary Meterological Satellite**

Agency: JMA Country: JAPAN loc: 12/31/89 Eom: / /

Orbit: GEOSTATIONARY 140E Apogee 35779 km Perigee 35779 km Incl.: 0.0° Repeat: Continuous

GMS VISSR — **Visible Infrared Spin-Scan Radiometer** — RAD

Stereo Capability: Off Axis Repeat:

Band(s)					Resolution	Swath
GMSV-01	VISIBLE	0.500	-	0.7500um	1250.0 m	13000 km
GMSV-02	LWIR	10.500	-	12.500um	5000.0 m	13000 km

GOES 1-7 — **Geostationary Operational Environmental System**

Agency: NASA Country: USA loc: 02/26/87 Eom: / /

Orbit: GEOSTATIONARY 76W Apogee 35830 km Perigee 35830 km Incl.: 0.0° Repeat: Continous

VAS — **VISSR and Atmospheric Sounder** — RAD

Stereo Capability: Off Axis Repeat:

Band(s)					Resolution	Swath
IR-01	CO2 ABS	14.600	-	14.810um	13800.0 m	13000 km
IR-02	CO2 ABS	14.290	-	14.620um	13800.0 m	13000 km
IR-03	CO2 ABS	14.060	-	14.390um	13800.0 m	13000 km
IR-04	LWIR	13.790	-	14.180um	13800.0 m	13000 km
IR-05	LWIR	13.120	-	13.480um	13800.0 m	13000 km
IR-06	MWIR	4.496	-	4.537um	13800.0 m	13000 km
IR-07	LWIR	12.500	-	12.820um	13800.0 m	13000 km
IR-08	LWIR	10.360	-	12.120um	13800.0 m	13000 km
IR-09	H20 ABS	7.143	-	7.353um	13800.0 m	13000 km
IR-10	H20 ABS	6.390	-	7.067um	13800.0 m	13000 km
IR-11	MWIR	4.386	-	4.484um	13800.0 m	13000 km
IR-12	H2O ABS	3.623	-	4.386um	13800.0 m	13000 km
V1	VISIBLE	0.550	-	0.700um	13800.0 m	13000 km

VISSR — **Visible Infrared Spin-Scan Radiometer** — RAD

Stereo Capability: Off Axis Repeat:

Band(s)					Resolution	Swath
IR	LWIR	10.500	-	12.600um	9000.0 m	13000 km
VIS	VISIBLE	0.550	-	0.700um	13800.0 m	13000 km

GOES 8-9 — **Geostationary Operational Environmental System IM**

Agency: NASA Country: USA loc: / / Eom: / /

Orbit: GEOSTATIONARY 75W 135W Apogee 35770 km Perigee 35770 km Incl.: 0.0° Repeat: Continuous

GVAR I-M — **GOES Variable Imaging Radiometer** — RAD

Stereo Capability: Off Axis Repeat:

Band(s)					Resolution	Swath
GVAR-IM-1	VISIBLE	0.550	-	0.750um	1000.0 m	13000 km
GVAR-IM-2	MWIR	3.800	-	4.000um	4000.0 m	13000 km
GVAR-IM-3	H20ABS	6.500	-	7.000um	8000.0 m	13000 km
GVAR-IM-4	LWIR	10.200	-	11.200um	4000.0 m	13000 km
GVAR-IM-5	LWIR	11.500	-	12.500um	4000.0 m	13000 km

Sounder — **GVAR 19-Channel Discrete-Filter Radiometer** — RAD

Stereo Capability: Off Axis Repeat:

Band(s)					Resolution	Swath

GVAR-DFR01	LWIR	14.710 -	14.710um	8700.0 m	13000 km
GVAR-DFR02	LWIR	14.370 -	14.370um	8700.0 m	13000 km
GVAR-DFR03	LWIR	14.060 -	14.060um	8700.0 m	13000 km
GVAR-DFR04	LWIR	13.960 -	13.960um	8700.0 m	13000 km
GVAR-DFR05	LWIR	13.370 -	13.370um	8700.0 m	13000 km
GVAR-DFR06	LWIR	12.660 -	12.660um	8700.0 m	13000 km
GVAR-DFR07	LWIR	12.020 -	12.020um	8700.0 m	13000 km
GVAR-DFR08	LWIR	11.030 -	11.030um	8700.0 m	13000 km
GVAR-DFR09	LWIR	9.710 -	9.710um	8700.0 m	13000 km
GVAR-DFR10	H20ABS	7.430 -	7.430um	8700.0 m	13000 km
GVAR-DFR11	H20ABS	7.020 -	7.020um	8700.0 m	13000 km
GVAR-DFR12	H20ABS	6.510 -	6.510um	8700.0 m	13000 km
GVAR-DFR13	MWIR	4.570 -	4.570um	8700.0 m	13000 km
GVAR-DFR14	MWIR	4.520 -	4.520um	8700.0 m	13000 km
GVAR-DFR15	MWIR	4.450 -	4.450um	8700.0 m	13000 km
GVAR-DFR16	MWIR	4.130 -	4.130um	8700.0 m	13000 km
GVAR-DFR17	MWIR	3.980 -	3.980um	8700.0 m	13000 km
GVAR-DFR18	MWIR	3.740 -	3.740um	8700.0 m	13000 km
GVAR-DFR19	VISIBLE	0.700 -	0.700um	8700.0 m	13000 km

GOMS — **Geostationary Operational Meteorological Satellite**

Agency: RSA | Country: RUSSIA | loc: 04/30/94 | Eom: / /

Orbit: GEOSTATIONARY 76 E | Apogee 36000 km Perigee 36000 km | Incl.: 0.0° | Repeat: Continuous

STR — **Scanning TV Radiometer** — RAD

Stereo Capability: | Off Axis Repeat:

Band(s)				Resolution	Swath
STR-1	VISIBLE	0.400 -	0.700um	1500.0 m	1350 km
STR-2	LWIR	10.500 -	12.500um	8000.0 m	1350 km

INSAT 1B/C/D — **Indian National Satellite System**

Agency: ISRO | Country: INDIA | loc: 08/30/83 | Eom: / /

Orbit: GEOSTATIONARY 74 E | Apogee 36000 km Perigee 36000 km | Incl.: 0.0° | Repeat: Continuous

VHRR I — **Very High Resolution Radiometer ISRO** — MSI

Stereo Capability: | Off Axis Repeat:

Band(s)				Resolution	Swath
VHRR-IR	LWIR	10.500 -	12.500um	11000.0 m	0 km
VHRR-V	VISIBLE	0.550 -	0.750um	2750.0 m	0 km

INSAT 2 A/B — **Indian National Satellite System**

Agency: ISRO | Country: INDIA | loc: 07/09/92 | Eom: / /

Orbit: GEOSATIONARY 74 E | Apogee 36000 km Perigee 36000 km | Incl.: 0.0° | Repeat: Continuous

VHRR II — **Very High Resolution Radiometer II ISRO** — MSI

Stereo Capability: | Off Axis Repeat:

Band(s)				Resolution	Swath
VHRR-IR	LWIR	10.500 -	12.500um	8000.0 m	0 km
VHRR-V	VISIBLE	0.550 -	0.750um	2000.0 m	0 km

IRS-A — **Indian Resources Satellite A**

Agency: ISRO | Country: INDIA | loc: 01/01/88 | Eom: / /

Orbit: SUN SYNCHRONOUS | Apogee 904 km Perigee 904 km | Incl.: 99.5° | Repeat: 22 Days

LISS-1 — **Linear Self Scanning Sensor 1** — MSI

Stereo Capability: | Off Axis Repeat:

Band(s)				Resolution	Swath
LISS-1A	BLUE	0.450 -	0.520um	72.0 m	148 km
LISS-1B	GREEN	0.520 -	0.590um	72.0 m	148 km
LISS-1C	RED	0.620 -	0.680um	72.0 m	148 km

LISS-1D	NIR	0.770 -	0.860um	72.0 m	148 km

IRS-B — **Indian Resources Satellite B**

Agency: ISRO | Country: INDIA | loc: 01/01/91 | Eom: / /

Orbit: SUN SYNCHRONOUS | Apogee 900 km | Perigee 900km | Incl.: 99.5° | Repeat: 22 Days

LISS-2 — **Linear Self Scanning Sensor 2** — MSI

Stereo Capability: | Off Axis Repeat:

Band(s)				Resolution	Swath
LISS-2A	BLUE	0.450 -	0.520um	36.0 m	74 km
LISS-2B	GREEN	0.520 -	0.590um	36.0 m	74 km
LISS-2C	RED	0.620 -	0.680um	36.0 m	74 km
LISS-2D	NIR	0.770 -	0.860um	36.0 m	74 km

IRS-C/D — **Indian Resources Satellite C & D**

Agency: ISRO | Country: INDIA | loc: 01/30/94 | Eom: / /

Orbit: SUN SYNCHRONOUS | Apogee 900 km | Perigee 900km | Incl.: 99.5° | Repeat: 5-24 Days

LISS-3 — **Linear Self Scanning Sensor 3** — MSI

Stereo Capability: | Off Axis Repeat:

Band(s)				Resolution	Swath
LISS-3A	GREEN	0.520 -	0.590um	20.0 m	140 km
LISS-3B	RED	0.620 -	0.680um	20.0 m	140 km
LISS-3C	NIR	0.770 -	0.860um	20.0 m	140 km
LISS-3D	SWIR	1.550 -	1.700um	70.0 m	140 km
LISS-3PAN	VISIBLE	0.500 -	0.750um	10.0 m	70 km

WIFS — **Wide Field Sensor** — MSI

Stereo Capability: | Off Axis Repeat:

Band(s)				Resolution	Swath
WIFS-1	RED	0.620 -	0.680um	188.0 m	740 km
WIFS-2	NIR	0.770 -	0.860um	188.0 m	740 km

IRS-P2 — **Indian Resources Satellite P2**

Agency: ISRO DLR | Country: INDIA GERMANY | loc: 01/01/95 | Eom: / /

Orbit: SUN SYNCHRONOUS | Apogee 817 km | Perigee 817km | Incl.: 98.0° | Repeat:

LISS-2 — **Linear Self Scanning Sensor 2** — MSI

Stereo Capability: | Off Axis Repeat:

Band(s)				Resolution	Swath
LISS-2A	BLUE	0.450 -	0.520um	36.0 m	74 km
LISS-2B	GREEN	0.520 -	0.590um	36.0 m	74 km
LISS-2C	RED	0.620 -	0.680um	36.0 m	74 km
LISS-2D	NIR	0.770 -	0.860um	36.0 m	74 km

MOS — **Multispectral Optoelectric Scanner** — MSI

Stereo Capability: | Off Axis Repeat:

Band(s)				Resolution	Swath
0MOS-C-2	SWIR	2.300 -	um	1500.0 m	195 km
MOS-A-01	NIR	0.7560 -	0.7574um	5800.0 m	200 km
MOS-A-02	NIR	0.7599 -	0.7613um	5800.0 m	200 km
MOS-A-03	NIR	0.7628 -	0.7642um	5800.0 m	200 km
MOS-A-04	NIR	0.7657 -	0.7671um	5800.0 m	200 km
MOS-B-01	BLUE	0.403 -	0.413um	1500.0 m	195 km
MOS-B-02	BLUE	0.438 -	0.448um	1500.0 m	195 km
MOS-B-03	BLUEGREEN	0.480 -	0.490um	1500.0 m	195 km
MOS-B-04	GREEN	0.515 -	0.525um	1500.0 m	195 km
MOS-B-05	GREEN	0.565 -	0.575um	1500.0 m	195 km
MOS-B-06	RED	0.610 -	0.620um	1500.0 m	195 km
MOS-B-07	RED	0.645 -	0.655um	1500.0 m	195 km

MOS-B-08	RED	0.680 -	0.690 um		1500.0 m	195 km
MOS-B-09	NIR	0.745 -	0.755 um		1500.0 m	195 km
MOS-B-10	NIR	0.810 -	0.820 um		1500.0 m	195 km
MOS-B-11	NIR	0.875 -	0.885 um		1500.0 m	195 km
MOS-B-12	NIR	0.940 -	0.950 um		1500.0 m	195 km
MOS-B-13	NIR	1.005 -	1.010 um		1500.0 m	195 km
MOS-G-01	SWIR	1.600 -	um		1500.0 m	195 km

ITOS-1 — **Improved TIROS Operational System**

Agency: NASA | Country: USA | loc: 02/28/70 | Eom: / /

Orbit: POLAR | Apogee 920 km | Perigee 890 km | Incl.: 102.0° | Repeat: Daily

VHRR — **Very High Resolution Radiometer** — MSI

Stereo Capability: | Off Axis Repeat:

Band(s)					Resolution	Swath
VHRR-1	RED	0.600 -	0.700 um		800.0 m	2580 km
VHRR-2	LWIR	10.500 -	12.500 um		800.0 m	2580 km

JERS-1 — **Japanese-Earth Resources Satellite**

Agency: NASDA | Country: JAPAN | loc: 02/11/92 | Eom: / /

Orbit: SUN SYNCHRONOUS | Apogee 568 km | Perigee 568 km | Incl.: 97.7° | Repeat: 44 Days

JERS-SAR — **JERS Synthetic Aperture Radar** — SAR

Stereo Capability: | Off Axis Repeat:

Band(s)					Resolution	Swath
L-SAR	L-BAND	1.275 -	GHz	HH	18.0 m	75 km

OPS — **JERS Optical Sensor** — MSI

Stereo Capability: Fwd/Aft | Off Axis Repeat:

Band(s)					Resolution	Swath
SWIR-1	SWIR	1.600 -	1.700 um		18.0 m	75 km
SWIR-2	SWIR	2.050 -	2.150 um		18.0 m	75 km
SWIR-3	SWIR	2.150 -	2.250 um		18.0 m	75 km
SWIR-4	SWIR	2.200 -	2.400 um		18.0 m	75 km
VNIR 1	GREEN	0.520 -	0.600 um		18.0 m	150 km
VNIR 2	RED	0.630 -	0.690 um		18.0 m	150 km
VNIR 3	NIR	0.760 -	0.860 um	Nadir Stereo	18.0 m	150 km
VNIR 4	NIR	0.760 -	0.860 um	Forward Stereo	18.0 m	75 km

LANDSAT4/5 — **Land Satellite**

Agency: EOSAT | Country: USA | loc: 01/01/82 | Eom: / /

Orbit: SUN SYNCHRONOUS | Apogee 705 km | Perigee 705 km | Incl.: 98.2° | Repeat: 16 Days

MSS — **Multispectral Scanner** — MSI

Stereo Capability: | Off Axis Repeat:

Band(s)				Resolution	Swath
MSS-1	GREEN	0.500 -	0.600 um	80.0 m	185 km
MSS-2	RED	0.600 -	0.700 um	80.0 m	185 km
MSS-3	NIR	0.700 -	0.800 um	80.0 m	185 km
MSS-4	NIR	0.800 -	11.000 um	80.0 m	185 km

TM — **Thematic Mapper** — MSI

Stereo Capability: | Off Axis Repeat:

Band(s)				Resolution	Swath
TM-1	BLUEGREEN	0.450 -	0.520 um	30.0 m	185 km
TM-2	GREEN	0.520 -	0.600 um	30.0 m	185 km
TM-3	RED	0.630 -	0.690 um	30.0 m	185 km
TM-4	NIR	0.760 -	0.900 um	30.0 m	185 km
TM-5	SWIR	1.550 -	1.750 um	30.0 m	185 km
TM-6	LWIR	10.400 -	12.500 um	120.0 m	185 km

TM-7	SWIR	2.080 -	2.350um		30.0 m	185 km

METEOR-3 — **Low Earth Orbiting Meteorological Satellite Series**

Agency: PLANETA | Country: RUSSIA | Ioc: 10/24/85 | Eom: / /

Orbit: POLAR | Apogee 1250 km Perigee 1200 km | Incl.: 82.5° | Repeat: Daily

MR-2000M — **TV Camera System** — CAM

Stereo Capability: | Off Axis Repeat:

Band(s)					Resolution	Swath
MR-2000	VISIBLE	0.500 -	0.700um	TV	1400.0 m	3100 km

MR-900B — **TV Camera System** — CAM

Stereo Capability: | Off Axis Repeat:

Band(s)					Resolution	Swath
MR-900B	VISIBLE	0.500 -	0.700um	TV	2000.0 m	3100 km

SCARAB — **Scanner for the Radiation Budget** — RAD

Stereo Capability: | Off Axis Repeat:

Band(s)				Resolution	Swath
SCARAB1	UV LWIR	0.200 -	50.000um	60000.0 m	3000 km
SCARAB2	UV MWIR	0.200 -	4.000um	60000.0 m	3000 km
SCARAB3	VISIBLE	0.500 -	0.700um	60000.0 m	3000 km
SCARAB4	LWIR	10.500 -	12.500um	60000.0 m	3000 km

SM — **Multi-channel Spectrometer** — SPEC

Stereo Capability: | Off Axis Repeat:

Band(s)				Resolution	Swath
SM-01	CO2 ABS	9.650 -	um	42000.0 m	1000 km
SM-02	LWIR	10.600 -	um	42000.0 m	1000 km
SM-03	LWIR	11.100 -	um	42000.0 m	1000 km
SM-04	LWIR	13.330 -	um	42000.0 m	1000 km
SM-05	LWIR	13.700 -	um	42000.0 m	1000 km
SM-06	LWIR	14.250 -	um	42000.0 m	1000 km
SM-07	LWIR	14.430 -	um	42000.0 m	1000 km
SM-08	LWIR	14.750 -	um	42000.0 m	1000 km
SM-09	LWIR	15.015 -	um	42000.0 m	1000 km
SM-10	LWIR	18.700 -	um	42000.0 m	1000 km

TOMS-M — **Total Ozone Mapping Spectrometer** — SPEC

Stereo Capability: | Off Axis Repeat:

Band(s)				Resolution	Swath
TOMS-1	UV	0.3125 -	um	47.0 m	3100 km
TOMS-2	UV	0.3175 -	um	47.0 m	3100 km
TOMS-3	UV	0.3313 -	um	47.0 m	3100 km
TOMS-4	UV	0.3398 -	um	47.0 m	3100 km
TOMS-5	UV	0.3600 -	um	47.0 m	3100 km
TOMS-6	UV	0.3800 -	um	47.0 m	3100 km

MOS-1 — **Marine Observation Satellite**

Agency: NASDA | Country: JAPAN | Ioc: 02/07/90 | Eom: / /

Orbit: SUN SYNCHRONOUS | Apogee 908 km Perigee 908 km | Incl.: 99.1° | Repeat: 44 Days

MESSR — **Multispectrum Electronic Self Scanning Radiometer** — MSI

Stereo Capability: | Off Axis Repeat:

Band(s)				Resolution	Swath
MESSR-1	GREEN	0.510 -	0.610um	50.0 m	100 km
MESSR-2	RED	0.610 -	0.710um	50.0 m	100 km
MESSR-3	NIR	0.710 -	0.810um	50.0 m	100 km
MESSR-4	NIR	0.810 -	1.100um	50.0 m	100 km

MSR — **Microwave Scanning Radiometer** — MWR

Stereo Capability: Off Axis Repeat:

Band(s)					Resolution	Swath
MSR 1	KA-BAND	32.000	-	GHz	23000.0 m	1500 km
MSR 2	K-BAND	22.000	-	GHz	32000.0 m	1500 km

VTIR — **Visible & Thermal Infrared Sensor** — MSI

Stereo Capability: Off Axis Repeat:

Band(s)					Resolution	Swath
VTIR 1	LWIR	8.500	-	14.000um	2700.0 m	1500 km
VTIR 2	LWIR	8.500	-	14.000um	2700.0 m	1500 km
VTIR 3	LWIR	8.500	-	14.000um	2700.0 m	1500 km
VTIR-VIS	VISIBLE	0.400	-	0.700um	900.0 m	1500 km

NIMBUS — NOAA Improved Bus Satellite NOAA-11

Agency: NOAA Country: USA Ioc: 10/24/78 Eom: / /

Orbit: SUN SYNCHRONOUS Apogee 900 km Perigee 98 km Incl.: 0.0° Repeat: Daily

CZCS — **Coastal Zone Color Scanner** — MSI

Stereo Capability: Off Axis Repeat:

Band(s)					Resolution	Swath
CZCS-1	BLUE	0.430	-	0.450um	825.0 m	1600 km
CZCS-2	GREEN	0.510	-	0.530um	825.0 m	1600 km
CZCS-3	GREEN	0.540	-	0.560um	825.0 m	1600 km
CZCS-4	RED	0.660	-	0.680um	825.0 m	1600 km
CZCS-5	NIR	0.700	-	0.800um	825.0 m	1600 km
CZCS-6	LWIR	10.500	-	12.500um	825.0 m	1600 km

ERB — **Earth Radiation Budget Monitor** — RAD

Stereo Capability: Off Axis Repeat:

Band(s)					Resolution	Swath
ERB	EMR	0.200	-	50.000um	500000.0 m	13000 km

LIMS — **Limb Infrared Monitor of the Stratosphere** — RAD

Stereo Capability: Off Axis Repeat:

Band(s)					Resolution	Swath
LIMS1	H2OABS	6.200	-	6.300um	500000.0 m	13000 km
LIMS2	H2OABS	6.700	-	6.800um	500000.0 m	13000 km
LIMS3	LWIR	9.600	-	9.700um	500000.0 m	13000 km
LIMS4	LWIR	11.300	-	11.400um	500000.0 m	13000 km
LIMS5	CO2ABS	15.200	-	15.300um	500000.0 m	13000 km
LIMS6	CO2ABS	13.200	-	17.200um	500000.0 m	13000 km

SAMII — **Stratospheric Aerosol Measurement II** — RAD

Stereo Capability: Off Axis Repeat:

Band(s)					Resolution	Swath
SAMII	NIR	0.900	-	1.100um	500000.0 m	13000 km

SAMS — **Stratospheric And Mesospheric Sounder** — RAD

Stereo Capability: Off Axis Repeat:

Band(s)					Resolution	Swath
SAMS1	LWIR	4.100	-	15.000um	500000.0 m	13000 km
SAMS2	LWIR	25.000	-	100.000um	500000.0 m	12000 km

SBUV/TOMS — **Solar Backscatter Ultraviolet/Total Ozone Mapper** — RAD

Stereo Capability: Off Axis Repeat:

Band(s)					Resolution	Swath
TOMS1	UV	0.250	-	0.380um	160000.0 m	13000 km
TOMS2	UV	0.160	-	0.400um	160000.0 m	13000 km

SMMR — **Scanning Multichannel Microwave Radiometer** — MWR

Stereo Capability: Off Axis Repeat:

Band(s)					Resolution	Swath
SMMR-1	X-BAND	6.630	-	GHz	136000.0 m	600 km
SMMR-2	X-BAND	10.690	-	GHz	87000.0 m	600 km
SMMR-3	KU-BAND	18.000	-	GHz	57000.0 m	600 km
SMMR-4	K-BAND	21.000	-	GHz	44000.0 m	600 km
SMMR-5	Q-BAND	37.000	-	GHz	28000.0 m	600 km

THIR — **Temperature Humidity Infrared Radiometer** — RAD

Stereo Capability: Off Axis Repeat:

Band(s)					Resolution	Swath
THIR	H2OABS	6.750	-	11.500um	500000.0 m	13000 km

RADARSAT — RADARSAT

Agency: CSA Country: CANADA Ioc: 03/01/95 Eom: / /

Orbit: SUN SYNCHRONOUS Apogee 800 km Perigee 800 km Incl.: 98.6° Repeat: 6 Days

C-Band SAR — **RADARSAT, Synthetic Aperture Radar** — SAR

Stereo Capability: Off Axis Repeat:

Band(s)						Resolution	Swath
EXTENDED-1	C-BAND	5.360	-	GHz	HH Extd1	19.0 m	75 km
EXTENDED-2	C-BAND	5.360	-	GHz	HH Extd2	28.0 m	170 km
FINE	C-BAND	5.360	-	GHz	HH Fine	9.0 m	45 km
SCAN-1	C-BAND	5.360	-	GHz	HH Scan1	50.0 m	305 km
SCAN-2	C-BAND	5.360	-	GHz	HH Scan	100.0 m	510 km
STANDARD	C-BAND	5.360	-	GHz	HH STD	25.0 m	100 km
WIDE-1	C-BAND	5.360	-	GHz	HH Wide	28.0 m	165 km
WIDE-2	C-BAND	5.360	-	GHz	HH Wide	25.0 m	150 km

RESURS-01-3 — Russian Earth Resource Satellite -O1 Series

Agency: RSA Country: RUSSIA Ioc: 01/01/95 Eom: / /

Orbit: SUN SYNCHRONOUS Apogee 660 km Perigee 660 km Incl.: 98.0° Repeat:

MSU-E — **Multispectral Scanner of High Resolution** — MSI

Stereo Capability: Off Axis Repeat:

Band(s)					Resolution	Swath
MSU-E-1	GREEN	0.500	-	0.600um	33.0 m	80 km
MSU-E-2	RED	0.600	-	0.700um	33.0 m	80 km
MSU-E-3	NIR	0.800	-	0.900um	33.0 m	80 km

MSU-SK — **Multispectral Scanner of Mod Conical Scan** — MSI

Stereo Capability: Off Axis Repeat:

Band(s)					Resolution	Swath
MSU-SK-1	GREEN	0.500	-	0.600um	170.0 m	600 km
MSU-SK-2	RED	0.600	-	0.700um	170.0 m	600 km
MSU-SK-3	NIR	0.700	-	0.800um	170.0 m	600 km
MSU-SK-4	NIR	0.800	-	1.100um	170.0 m	600 km
MSU-SK-5	LWIR	10.400	-	12.600um	600.0 m	600 km

TRAVERS — **Synthetic Aperture Radar** — SAR

Stereo Capability: Off Axis Repeat:

Band(s)					Resolution	Swath
TRAVERS	S-BAND	3.280	-	GHz	200.0 m	50 km

RESURS-02 — Russian Earth Resource Satellite -O2 Series

Agency: RSA Country: RUSSIA Ioc: 02/01/94 Eom: / /

Orbit: SUN SYNCHRONOUS Apogee 660 km Perigee 660 km Incl.: 98.0° Repeat:

MSU-E — **Multispectral Scanner of High Resolution** — MSI

Stereo Capability: — Off Axis Repeat:

Band(s)				Resolution	Swath
MSU-E-1	GREEN	0.500 -	0.600um	33.0 m	80 km
MSU-E-2	RED	0.600 -	0.700um	33.0 m	80 km
MSU-E-3	NIR	0.800 -	0.900um	33.0 m	80 km

MSU-SK — **Multispectral Scanner of Mod Conical Scan** — MSI

Stereo Capability: — Off Axis Repeat:

Band(s)				Resolution	Swath
MSU-SK-1	GREEN	0.500 -	0.600um	170.0 m	600 km
MSU-SK-2	RED	0.600 -	0.700um	170.0 m	600 km
MSU-SK-3	NIR	0.700 -	0.800um	170.0 m	600 km
MSU-SK-4	NIR	0.800 -	1.100um	170.0 m	600 km
MSU-SK-5	LWIR	10.400 -	12.600um	600.0 m	600 km

RESURS-F — Russian Earth Resource Satellite -F Series

Agency: RSA — Country: RUSSIA — loc: 01/01/75 — Eom: / /

Orbit: POLAR — Apogee 240 km Perigee 275 km — Incl.: 82.3° Repeat: n/a

KFA-1000 — **Camera System 1000mm** — CAM

Stereo Capability: Fwd/Aft — Off Axis Repeat:

Band(s)					Resolution	Swath
KFA-1000-L	VNIR	0.570 -	0.800um	Left	5.0 m	120 km
KFA-1000-R	VNIR	0.570 -	0.800um	Right	5.0 m	120 km

KFA-200 — **Camera System 200 mm** — CAM

Stereo Capability: Fwd/Aft — Off Axis Repeat:

Band(s)				Resolution	Swath
KFA-200-1	GREEN	0.510 -	0.600um	25.0 m	180 km
KFA-200-2	NIR	0.700 -	0.840um	25.0 m	180 km
KFA-200-3	RED	0.600 -	0.700um	25.0 m	180 km

MK-4 — **4-Channel Camera System 300mm** — CAM

Stereo Capability: Fwd/Aft — Off Axis Repeat:

Band(s)				Resolution	Swath
MK-4-1	RED	0.640 -	0.690um	14.0 m	144 km
MK-4-2	NIR	0.810 -	0.860um	14.0 m	144 km
MK-4-3	GREEN	0.515 -	0.565um	14.0 m	144 km
MK-4-4	BLUEGREEN	0.460 -	0.510um	14.0 m	144 km
MK-4-5	RED	0.610 -	0.750um	14.0 m	144 km
MK-4-6	VISIBLE	0.435 -	0.680um	14.0 m	144 km

RESURS-O — Russian Earth Resource Satellite -O Series

Agency: RSA — Country: RUSSIA — loc: 03/10/85 — Eom: / /

Orbit: SUN SYNCHRONOUS — Apogee 660 km Perigee 660 km — Incl.: 98.0° Repeat: n/a

MSU-E — **Multispectral Scanner of High Resolution** — MSI

Stereo Capability: — Off Axis Repeat:

Band(s)				Resolution	Swath
MSU-E-1	GREEN	0.500 -	0.600um	33.0 m	80 km
MSU-E-2	RED	0.600 -	0.700um	33.0 m	80 km
MSU-E-3	NIR	0.800 -	0.900um	33.0 m	80 km

MSU-SK — **Multispectral Scanner of Mod Conical Scan** — MSI

Stereo Capability: — Off Axis Repeat:

Band(s)				Resolution	Swath
MSU-SK-1	GREEN	0.500 -	0.600um	170.0 m	600 km
MSU-SK-2	RED	0.600 -	0.700um	170.0 m	600 km
MSU-SK-3	NIR	0.700 -	0.800um	170.0 m	600 km
MSU-SK-4	NIR	0.800 -	1.100um	170.0 m	600 km

MSU-SK-5	LWIR	10.400 -	12.600um	600.0 m	600 km

TRAVERS — **Synthetic Aperture Radar** — SAR

Stereo Capability: Off Axis Repeat:

Band(s)				Resolution	Swath
TRAVERS	S-BAND	3.280 -	GHz	200.0 m	50 km

SEASAT — **Sea Satellite**

Agency: NOAA Country: USA Ioc: 07/07/78 Eom:10/09/78

Orbit:ELLIPTICAL Apogee 800 km Perigee 776km Incl.: 108.0° Repeat: n/a

SASS — **Seasat Active Scatterometer System** — SCAT

Stereo Capability: Off Axis Repeat:

Band(s)				Resolution	Swath
SS SASS	KU-BAND	14.600 -	GHz	50000.0 m	1000 km

SEASAT VIR — **Seasat Visible Near Infrared Sensor** — MSI

Stereo Capability: Off Axis Repeat:

Band(s)				Resolution	Swath
VIR-1	VISNIR	0.470 -	0.940um	2000.0 m	2280 km
VIR-2	LWIR	10.500 -	12.500um	4000.0 m	2280 km

SEASAT-SAR — **Seasat Synthetic Aperture Radar** — SAR

Stereo Capability: Off Axis Repeat:

Band(s)					Resolution	Swath
SEASAT-SAR	L-BAND	1.350 -	GHz	HH	25.0 m	100 km

SMMR — **Scanning Multichannel Microwave Radiometer** — MWR

Stereo Capability: Off Axis Repeat:

Band(s)				Resolution	Swath
SMMR-1	X-BAND	6.630 -	GHz	136000.0 m	600 km
SMMR-2	X-BAND	10.690 -	GHz	87000.0 m	600 km
SMMR-3	KU-BAND	18.000 -	GHz	57000.0 m	600 km
SMMR-4	K-BAND	21.000 -	GHz	44000.0 m	600 km
SMMR-5	Q-BAND	37.000 -	GHz	28000.0 m	600 km

SEASTAR — **Sea Star S/C**

Agency: NASA Country: USA Ioc: 07/30/94 Eom: / /

Orbit:SUN SYNCHRONOUS Apogee 705 km Perigee 705km Incl.: 98.2° Repeat: 2 Days

SeaWIFS — **Sea Wide Field Sensor** — MSI

Stereo Capability: Off Axis Repeat:

Band(s)				Resolution	Swath
SEAWIFS-1	BLUE	0.402 -	0.422um	1130.0 m	2800 km
SEAWIFS-2	BLUE	0.433 -	0.543um	1130.0 m	2800 km
SEAWIFS-3	BLUE	0.480 -	0.500um	1130.0 m	2800 km
SEAWIFS-4	GREEN	0.500 -	0.520um	1130.0 m	2800 km
SEAWIFS-5	GREEN	0.545 -	0.565um	1130.0 m	2800 km
SEAWIFS-6	RED	0.660 -	0.680um	1130.0 m	2800 km
SEAWIFS-7	NIR	0.745 -	0.785um	1130.0 m	2800 km
SEAWIFS-8	NIR	0.845 -	0.885um	1130.0 m	2800 km

SMS 1&2 — **Synchronous Meterological Satellite**

Agency: NOAA Country: USA Ioc: 06/27/74 Eom: / /

Orbit:GEOSTATIONARY 76E135W Apogee 35830 km Perigee 35830km Incl.: 0.0° Repeat: Continous

VISSR — **Visible Infrared Spin-Scan Radiometer** — RAD

Stereo Capability: Off Axis Repeat:

Band(s)				Resolution	Swath
IR	LWIR	10.500 -	12.600um	9000.0 m	13000 km
VIS	VISIBLE	0.550 -	0.700um	13800.0 m	13000 km

SPOT 1 & 2 — **Satellite Probatoire de l'Observation de la Terre**

Agency: CNES | Country: FRANCE | loc: 01/01/86 | Eom: / /

Orbit: SUN SYNCHRONOUS | Apogee 832 km | Perigee 832 km | Incl.: 98.7° | Repeat: 26 Days

HRV — **High Resolution Visible Sensor** — E-O MSI

Stereo Capability: Cross Track | Off Axis Repeat: 2 Days

Band(s)					Resolution	Swath
HRV PAN	VISIBLE	0.510 -	0.730 um	Stereo	10.0 m	60 km
HRV-1	GREEN	0.500 -	0.590 um		20.0 m	60 km
HRV-2	RED	0.610 -	0.680 um		20.0 m	60 km
HRV-3	NIR	0.790 -	0.890 um		20.0 m	60 km

SPOT 3 — **Satellite Probatoire de l'Observation de la Terre**

Agency: CNES | Country: FRANCE | loc: 09/26/93 | Eom: / /

Orbit: SUN SYNCHRONOUS | Apogee 832 km | Perigee 832 km | Incl.: 98.7° | Repeat: 26 Days

HRV — **High Resolution Visible Sensor** — E-O MSI

Stereo Capability: Cross Track | Off Axis Repeat: 2 Days

Band(s)					Resolution	Swath
HRV PAN	VISIBLE	0.510 -	0.730 um	Stereo	10.0 m	60 km
HRV-1	GREEN	0.500 -	0.590 um		20.0 m	60 km
HRV-2	RED	0.610 -	0.680 um		20.0 m	60 km
HRV-3	NIR	0.790 -	0.890 um		20.0 m	60 km

POAM-II — **Polar Ozone and Aerosol Measurement II** — PDET

Stereo Capability: | Off Axis Repeat:

Band(s)					Resolution	Swath
POAM 1	UV	0.350 -	0.355 um	Vertical limb	600.0 m	0 km
POAM 2	BLUE	0.441 -	0.443 um	Vertical limb	600.0 m	0 km
POAM 3	BLUEGREEN	0.447 -	0.449 um	Vertical limb	600.0 m	0 km
POAM 4	RED	0.593 -	0.608 um	Vertical limb	600.0 m	0 km
POAM 5	NIR	0.760 -	0.762 um	Vertical limb	600.0 m	0 km
POAM 6	NIR	0.773 -	0.880 um	Vertical limb	600.0 m	0 km
POAM 7	NIR	0.919 -	0.921 um	Vertical limb	600.0 m	0 km
POAM 8	NIR	0.935 -	0.937 um	Vertical limb	600.0 m	0 km
POAM 9	NIR	1.054 -	10.064 um	Vertical limb	600.0 m	0 km

SPOT 4 — **Satellite Probatoire de l'Observation de la Terre**

Agency: CNES | Country: FRANCE | loc: 01/01/97 | Eom: / /

Orbit: SUN SYNCHRONOUS | Apogee 832 km | Perigee 832 km | Incl.: 98.7° | Repeat: 26 Days

HRVIR — **High Resolution Visible and Infrared Sensor** — E-O MSI

Stereo Capability: Cross Track | Off Axis Repeat: 2 Days

Band(s)					Resolution	Swath
HRVIR-1	BLUEGREEN	0.430 -	0.470 um		20.0 m	85 km
HRVIR-2	GREEN	0.500 -	0.590 um		20.0 m	85 km
HRVIR-3	RED	0.610 -	0.680 um		10.0 m	85 km
HRVIR-4	NIR	0.780 -	0.890 um		20.0 m	85 km
HRVIR-5	SWIR	1.580 -	1.750 um		20.0 m	85 km
HRVIR-PAN	VISIBLE	.0510 -	0.730 um		10.0 m	85 km

VEGETATION — **Vegetation Sensor** — RAD

Stereo Capability: | Off Axis Repeat:

Band(s)			Resolution	Swath
VEG1	VNIR	-	1100.0 m	2200 km

SSR1 — **Satellite de Sensoiamento Remoto**

Agency: INPE | Country: BRAZIL | loc: 01/01/97 | Eom: / /

Orbit: SUN SYNCHRONOUS | Apogee 640 km | Perigee 640 km | Incl.: 0.0° | Repeat:

WFI — **Wide Field Imager** — MSI

Stereo Capability: — Off Axis Repeat:

Band(s)				Resolution	Swath
WFI-1	RED	0.630 -	0.690um	260.0 m	856 km
WFI-2	NIR	0.770 -	0.890um	260.0 m	856 km

TIROS-N — **Television InfraRed Observation System**

Agency: NOAA — Country: USA — loc: 04/01/60 — Eom: / /

Orbit: SUN SYNCHRONOUS — Apogee 850 km Perigee 800km Incl.: 99.0° Repeat: Daily

AVHRR — **Advanced Very High Resolution Radiometer** — MSI

Stereo Capability: — Off Axis Repeat:

Band(s)				Resolution	Swath
AVHRR-1	RED	0.580 -	0.680um	1100.0 m	2700 km
AVHRR-2	NIR	0.720 -	1.100um	1100.0 m	2700 km
AVHRR-2A	NIR	0.820 -	0.870um	1100.0 m	2700 km
AVHRR-3	MWIR	3.550 -	3.930um	1100.0 m	2700 km
AVHRR-3A	SWIR	1.570 -	1.780um	1100.0 m	2700 km
AVHRR-4	LWIR	10.300 -	11.300um	1100.0 m	2700 km
AVHRR-5	LWIR	11.500 -	12.500um	1100.0 m	2700 km

TOV HIRS/2 — **TIROS Operational Vehicle Sound HIRes IR Spectrometer** — RAD

Stereo Capability: — Off Axis Repeat:

Band(s)				Resolution	Swath
HIRS 01-05	LWIR	13.970 -	14.950um	17400.0 m	1120 km
HIRS 06-07	LWIR	13.350 -	13.640um	17400.0 m	1120 km
HIRS 08	LWIR	11.110 -	11.110um	17400.0 m	1120 km
HIRS 09	LWIR	9.710 -	9.710um	17400.0 m	1120 km
HIRS 10-12	LWIR	6.720 -	8.160um	17400.0 m	1120 km
HIRS 13-17	MWIR	4.240 -	4.570um	17400.0 m	1120 km
HIRS 18-20	VISNIR	0.690 -	4.000um	17400.0 m	1120 km

TOV MSU — **TIROS Operational Vehicle Sound Microwave Sounding Unit** — MWR

Stereo Capability: — Off Axis Repeat:

Band(s)				Resolution	Swath
TOVS MSU 1	V-BAND	50.310 -	um	105000.0 m	2320 km
TOVS MSU 2	V-BAND	50.730 -	GHz	105000.0 m	2320 km
TOVS MSU 3	V-BAND	54.960 -	GHz	105000.0 m	2320 km
TOVS MSU 4	W-BAND	54.950 -	GHz	105000.0 m	2320 km

TOV SSU — **TIROS Operational Vehicle Stratospheric Sounding Unit** — MWR

Stereo Capability: — Off Axis Repeat:

Band(s)				Resolution	Swath
SSU	LWIR	9.000 -	15.000um	147300.0 m	1473 km

TRMM — **Tropical Rainfall Measuring Mission**

Agency: NASDA NASA — Country: JAPAN USA — loc: 08/01/97 — Eom: / /

Orbit: CIRCULAR — Apogee 370 km Perigee 370km Incl.: 35.0° Repeat:

CERES — **Clouds & Earth's Radiant Energy System** — RAD

Stereo Capability: — Off Axis Repeat:

Band(s)					Resolution	Swath
CERES-1	VNIR LWIR	0.300 -	50.000um	Total Radiance	21000.0 m	13000 km
CERES-2	VNIR MWIR	0.300 -	5.000um	Shortwave	21000.0 m	13000 km
CERES-3	LWIR	8.000 -	14.000um	Longwave	21000.0 m	13000 km

LIS — **Lightening Imaging Sensor** — RAD

Stereo Capability: — Off Axis Repeat:

Band(s)				Resolution	Swath
LIS	NIR	0.777 -	um	8500.0 m	600 km

PR — **Precipitation Radar** — SCAT

Stereo Capability: Off Axis Repeat:

Band(s)					Resolution	Swath
PR-1	KU-BAND	13.796 -	GHz	H	4300.0 m	220 km
PR-2	KU-BAND	13.802 -	GHz	H	4300.0 m	220 km

TMI — **TRMM Microwave Imager** — MWR

Stereo Capability: Off Axis Repeat:

Band(s)				Resolution	Swath
TMI-1	X-BAND	10.700 -	GHz	4400.0 m	790 km
TMI-2	K-BAND	19.400 -	GHz	9100.0 m	790 km
TMI-3	K-BAND	21.300 -	GHz	10500.0 m	790 km
TMI-4	Q-BAND	37.000 -	GHz	18500.0 m	790 km
TMI-5	W-BAND	85.500 -	GHz	45000.0 m	790 km

VIRS — **Visible InfraRed Scanner** — RAD

Stereo Capability: Off Axis Repeat:

Band(s)				Resolution	Swath
VIRS-1	RED	0.630 -	um	2000.0 m	720 km
VIRS-2	SWIR	1.600 -	um	2000.0 m	720 km
VIRS-3	MWIR	3.750 -	um	2000.0 m	720 km
VIRS-4	LWIR	10.800 -	um	2000.0 m	720 km
VIRS-5	LWIR	12.00 -	um	2000.0 m	720 km

UARS — **Upper Atmosphere Research Satellite**

Agency: NASA Country: USA loc: 09/13/91 Eom: / /

Orbit: CIRCULAR Apogee 600 km Perigee 600 km Incl.: 57.0° Repeat:

SOLSTICE — **Solar Stellar Irradiance Comparrison Experiment** — RAD

Stereo Capability: Off Axis Repeat:

Band(s)					Resolution	Swath
SOL 1-5	UV	0.005 -	.440 um	5 Channels	1300000.0 m	130000 km

WorldView — **World View Imaging Corp**

Agency: CIV Country: USA loc: 12/31/95 Eom: / /

Orbit: SUN SYNCHRONOUS Apogee 475 km Perigee 475 km Incl.: 98.0° Repeat: 120 Days

WV-MSS — **WorldView Multispectral Scanner** — MSI

Stereo Capability: Off Axis Repeat: 2 Days

Band(s)				Resolution	Swath
WV-1	GREEN	0.600 -	0.600 um	15.0 m	900 km
WV-2	RED	0.610 -	0.680 um	15.0 m	900 km
WV-3	NIR	0.790 -	0.890 um	15.0 m	900 km

WV-Stereo — **WorldView Stereo Sensor** — E-O

Stereo Capability: Fwd/Aft Off Axis Repeat:

Band(s)				Resolution	Swath
WV-PAN	VISIBLE	0.450 -	0.800 um	3.0 m	36 km

Appendix B: Database Listing Satellite Synthetic Aperture Radars

ALMAZ-1 — **ALMAZ-1 S/C SARSAT**

Agency: RSA | Country: RUSSIA | loc: 03/31/91 | Eom: / /

Orbit: POLAR | Apogee 300 km | Perigee 360 km | Incl.: 72.7° | Repeat: n/a

MAZ-1 — **ALMAZ-1, Synthetic Aperture Radar** — SAR

Stereo Capability: | Off Axis Repeat:

Band(s)					Resolution	Swath
S-SAR	S-BAND	3.125 -	GHz		10.0 m	40 km

ALMAZ-1B — **ALMAZ-1B, Earth Remote Sensing Satellite**

Agency: RSA | Country: RUSSIA | loc: 12/31/96 | Eom: / /

Orbit: POLAR | Apogee 400 km | Perigee 400 km | Incl.: 73.0° | Repeat: Variable

SAR-10 — **ALMAZ-1B, Synthetic Aperture S-Band Radar** — SAR

Stereo Capability: | Off Axis Repeat:

Band(s)					Resolution	Swath
SAR-10	S-BAND	3.130 -	GHz	VV,HH,	5.0 m	55 km
SAR-10	S-BAND	3.130 -	GHz	VV,HH,	15.0 m	70 km
SAR-10	S-BAND	3.130 -	GHz	VV,HH,	15.0 m	170 km

SAR-3 — **ALMAZ-1B, Synthetic Aperture X-Band Radar** — SAR

Stereo Capability: | Off Axis Repeat:

Band(s)					Resolution	Swath
SAR-3	X-BAND	8.600 -	GHz	VV	5.0 m	35 km

SAR-70 — **ALMAZ-1B, Synthetic Aperture P-Band Radar** — SAR

Stereo Capability: | Off Axis Repeat:

Band(s)					Resolution	Swath
SAR-70	P-BAND	43.00 -	MHz	VV,HH,	22.0 m	170 km

COSMOS1870 — **COSMOS 1870, ALMAZ Prototype, USSR**

Agency: RSA | Country: RUSSIA | loc: 07/25/87 | Eom: 07/30/89

Orbit: CIRCULAR | Apogee 275 km | Perigee 275 km | Incl.: 73.0° | Repeat: n/a

S-Band SAR — **COSMOS 1870, Synthetic Aperture Radar** — SAR

Stereo Capability: | Off Axis Repeat:

Band(s)					Resolution	Swath
SAR-1870	S-BAND	3.125 -	GHz	VV	25.0 m	20 km

ERS-1 — **European Remote Sensing Satellite 1**

Agency: ESA | Country: EUROPEAN | loc: 07/17/91 | Eom: / /

Orbit: CIRCULAR | Apogee 610 km | Perigee 610 km | Incl.: 57.0° | Repeat: 35 Days

ERS-AMI — **ERS Synthetic Aperture Radar** — SAR

Stereo Capability: | Off Axis Repeat:

Band(s)					Resolution	Swath
ERS-AMI1	C-BAND	5.360 -	GHz	VV Image	30.0 m	100 km
ERS-AMI2	C-BAND	5.360 -	GHz	LV Wave	30.0 m	100 km

ERS-2 — **European Remote Sensing Satellite 2**

Agency: ESA | Country: EUROPEAN | loc: 12/31/94 | Eom: / /

Orbit: SUN SYNCHRONOUS | Apogee 824 km | Perigee 824 km | Incl.: 0.0° | Repeat:

ERS-AMI — **ERS Synthetic Aperture Radar** — SAR

Stereo Capability: | Off Axis Repeat:

Band(s)					Resolution	Swath
ERS-AMI1	C-BAND	5.360 -	GHz	VV Image	30.0 m	100 km
ERS-AMI2	C-BAND	5.360 -	GHz	LV Wave	30.0 m	100 km

JERS-1 — **Japanese-Earth Resources Satellite**

Agency: NASDA | Country: JAPAN | loc: 02/11/92 | Eom: / /

Orbit: SUN SYNCHRONOUS | Apogee 568 km | Perigee 568km | Incl.: 97.7° | Repeat: 44 Days

JERS-SAR — **JERS Synthetic Aperture Radar** — SAR

Stereo Capability: | Off Axis Repeat:

Band(s)					Resolution	Swath
L-SAR	L-BAND	1.275 -	GHz	HH	18.0 m	75 km

RADARSAT — **RADARSAT**

Agency: CSA | Country: CANADA | loc: 03/01/95 | Eom: / /

Orbit: SUN SYNCHRONOUS | Apogee 800 km | Perigee 800km | Incl.: 98.6° | Repeat: 6 Days

C-Band SAR — **RADARSAT, Synthetic Aperture Radar** — SAR

Stereo Capability: | Off Axis Repeat:

Band(s)					Resolution	Swath
EXTENDED-1	C-BAND	5.360 -	GHz	HH Extd1	19.0 m	75 km
EXTENDED-2	C-BAND	5.360 -	GHz	HH Extd2	28.0 m	170 km
FINE	C-BAND	5.360 -	GHz	HH Fine	9.0 m	45 km
SCAN-1	C-BAND	5.360 -	GHz	HH Scan1	50.0 m	305 km
SCAN-2	C-BAND	5.360 -	GHz	HH Scan	100.0 m	510 km
STANDARD	C-BAND	5.360 -	GHz	HH STD	25.0 m	100 km
WIDE-1	C-BAND	5.360 -	GHz	HH Wide	28.0 m	165 km
WIDE-2	C-BAND	5.360 -	GHz	HH Wide	25.0 m	150 km

RESURS-01-3 — **Russian Earth Resource Satellite -O1 Series**

Agency: RSA | Country: RUSSIA | loc: 01/01/95 | Eom: / /

Orbit: SUN SYNCHRONOUS | Apogee 660 km | Perigee 660km | Incl.: 98.0° | Repeat:

TRAVERS — **Synthetic Aperture Radar** — SAR

Stereo Capability: | Off Axis Repeat:

Band(s)					Resolution	Swath
TRAVERS	S-BAND	3.280 -	GHz		200.0 m	50 km

RESURS-O — **Russian Earth Resource Satellite -O Series**

Agency: RSA | Country: RUSSIA | loc: 03/10/85 | Eom: / /

Orbit: SUN SYNCHRONOUS | Apogee 660 km | Perigee 660km | Incl.: 98.0° | Repeat: n/a

TRAVERS — **Synthetic Aperture Radar** — SAR

Stereo Capability: | Off Axis Repeat:

Band(s)					Resolution	Swath
TRAVERS	S-BAND	3.280 -	GHz		200.0 m	50 km

SEASAT — **Sea Satellite**

Agency: NOAA | Country: USA | loc: 07/07/78 | Eom: 10/09/78

Orbit: ELLIPTICAL | Apogee 800 km | Perigee 776km | Incl.: 108.0° | Repeat: n/a

SEASAT-SAR — **Seasat Synthetic Aperture Radar** — SAR

Stereo Capability: | Off Axis Repeat:

Band(s)					Resolution	Swath
SEASAT-SAR	L-BAND	1.350 -	GHz	HH	25.0 m	100 km

Appendix C: Database Listing Satellite Sensor With Resolution Better Than 30m.

ADEOS — **Advanced Earth Observing Satellite**

Agency: NASDA | Country: JAPAN | loc: 01/01/96 | Eom: / /

Orbit: SUN SYNCHRONOUS | Apogee 800 km | Perigee 800 km | Incl.: 98.6° | Repeat: 41 days

AVNIR — **Advanced Visible & Near Infrared Radiometer** — MSI

Stereo Capability: Cross Track | Off Axis Repeat: 1 Day

Band(s)				Resolution	Swath
AVNIR-1	BLUEGREEN	0.420 -	0.520 um	16.0 m	80 km
AVNIR-2	GREEN	0.520 -	0.600 um	16.0 m	80 km
AVNIR-3	RED	0.630 -	0.690 um	16.0 m	80 km
AVNIR-4	NIR	0.760 -	0.860 um	16.0 m	80 km
AVNIR-PAN	VISIBLE	0.400 -	0.700 um	8.0 m	80 km

ALMAZ-1 — **ALMAZ-1 S/C SARSAT**

Agency: RSA | Country: RUSSIA | loc: 03/31/91 | Eom: / /

Orbit: POLAR | Apogee 300 km | Perigee 360 km | Incl.: 72.7° | Repeat: n/a

MAZ-1 — **ALMAZ-1, Synthetic Aperture Radar** — SAR

Stereo Capability: | Off Axis Repeat:

Band(s)				Resolution	Swath
S-SAR	S-BAND	3.125 -	GHz	10.0 m	40 km

ALMAZ-1B — **ALMAZ-1B, Earth Remote Sensing Satellite**

Agency: RSA | Country: RUSSIA | loc: 12/31/96 | Eom: / /

Orbit: POLAR | Apogee 400 km | Perigee 400 km | Incl.: 73.0° | Repeat: Variable

BALKAN-2 — **Balkan-2 Lidar** — LIDAR

Stereo Capability: | Off Axis Repeat:

Band(s)					Resolution	Swath
BAL-1	GREEN	0.532 -	um	ND YAG	10.0 m	140 km

OSSI — **Optronic Sensor for Stereo Imagery** — MSI

Stereo Capability: Fwd/Aft | Off Axis Repeat:

Band(s)				Resolution	Swath
OSSI-1	GREEN	0.500 -	0.600 um	4.0 m	80 km
OSSI-2	RED	0.600 -	0.700 um	4.0 m	80 km
OSSI-2	NIR	0.700 -	0.800 um	4.0 m	80 km
OSSI-PAN	VNIR	0.580 -	0.800 um	2.5 m	80 km

SAR-10 — **ALMAZ-1B, Synthetic Aperture S-Band Radar** — SAR

Stereo Capability: | Off Axis Repeat:

Band(s)					Resolution	Swath
SAR-10	S-BAND	3.130 -	GHz	VV,HH,	5.0 m	55 km
SAR-10	S-BAND	3.130 -	GHz	VV,HH,	15.0 m	70 km
SAR-10	S-BAND	3.130 -	GHz	VV,HH,	15.0 m	170 km

SAR-3 — **ALMAZ-1B, Synthetic Aperture X-Band Radar** — SAR

Stereo Capability: | Off Axis Repeat:

Band(s)					Resolution	Swath
SAR-3	X-BAND	8.600 -	GHz	VV	5.0 m	35 km

SAR-70 — **ALMAZ-1B, Synthetic Aperture P-Band Radar** — SAR

Stereo Capability: | Off Axis Repeat:

Band(s)					Resolution	Swath
SAR-70	P-BAND	43.00 -	MHz	VV,HH,	22.0 m	170 km

CBERS — **China-Brazil Earth Resources Satellite**

Agency: INPE CSA | Country: CHINA BRAZIL | loc: 12/31/96 | Eom: / /

Orbit: SUN SYNCHRONOUS | Apogee 778 km | Perigee 778 km | Incl.: 98.5° | Repeat: 26 Days

CCD — **Charge-Coupled Device Camera** — MSI

Stereo Capability: Cross Track — Off Axis Repeat: 3 Days

Band(s)					Resolution	Swath
CCD-1	VISIBLE	0.510 -	0.730 um		19.5 m	120 km
CCD-2	BLUEGREEN	0.450 -	0.520 um		19.5 m	120 km
CCD-3	GREEN	0.520 -	0.590 um		19.5 m	120 km
CCD-4	RED	0.630 -	0.690 um		19.5 m	120 km
CCD-5	NIR	0.770 -	0.890 um		19.5 m	120 km

COSMOS1870 — COSMOS 1870, ALMAZ Prototype, USSR

Agency: RSA — Country: RUSSIA — loc: 07/25/87 — Eom: 07/30/89

Orbit: CIRCULAR — Apogee 275 km Perigee 275 km — Incl.: 73.0° Repeat: n/a

S-Band SAR — **COSMOS 1870, Synthetic Aperture Radar** — SAR

Stereo Capability: — Off Axis Repeat:

Band(s)					Resolution	Swath
SAR-1870	S-BAND	3.125 -	GHz	VV	25.0 m	20 km

CRESS — Civilian Remote Sensing Satellite

Agency: LOCKHEED — Country: USA — loc: / / — Eom: / /

Orbit: SUN SYNCHRONOUS — Apogee 0 km Perigee 0 km — Incl.: 98.0° Repeat: 247

CRSS-1 — **CRSS Stereo Sensor** — E-O

Stereo Capability: Fwd/Aft — Off Axis Repeat:

Band(s)					Resolution	Swath
CRSS-1	VISIBLE	0.450 -	0.800 um	Stereo	1.0 m	0 km

EOS AM-1 — Earth Observation System, Ante Meridian Mission

Agency: NASA — Country: USA — loc: 01/01/98 — Eom: / /

Orbit: SUN SYNCHRONOUS — Apogee 705 km Perigee 705 km — Incl.: 99.0° Repeat: 49 DAYS

ASTER — **Advanced Spaceborne Thermal Emission & Radiation Radiometer** — RAD

Stereo Capability: Fwd/Aft — Off Axis Repeat: 5 Days

Band(s)					Resolution	Swath
ASTER-SWIR	SWIR	1.600 -	2.500 um	6 Bands	30.0 m	0 km
ASTER-VNIR	VNIR	0.500 -	0.900 um	3 Bands	15.0 m	0 km

ERS-1 — European Remote Sensing Satellite 1

Agency: ESA — Country: EUROPEAN — loc: 07/17/91 — Eom: / /

Orbit: CIRCULAR — Apogee 610 km Perigee 610 km — Incl.: 57.0° Repeat: 35 Days

ERS-ALT — **ERS Altimeter** — ALT

Stereo Capability: — Off Axis Repeat:

Band(s)					Resolution	Swath
ERS-ALT	KU-BAND	13.700 -	GHz	VV	20.0 m	80 km

ERS-AMI — **ERS Synthetic Aperture Radar** — SAR

Stereo Capability: — Off Axis Repeat:

Band(s)					Resolution	Swath
ERS-AMI1	C-BAND	5.360 -	GHz	VV Image	30.0 m	100 km
ERS-AMI2	C-BAND	5.360 -	GHz	LV Wave	30.0 m	100 km

ERS-2 — European Remote Sensing Satellite 2

Agency: ESA — Country: EUROPEAN — loc: 12/31/94 — Eom: / /

Orbit: SUN SYNCHRONOUS — Apogee 824 km Perigee 824 km — Incl.: 0.0° Repeat:

ERS-ALT — **ERS Altimeter** — ALT

Stereo Capability: — Off Axis Repeat:

Band(s)					Resolution	Swath
ERS-ALT	KU-BAND	13.700 -	GHz	VV	20.0 m	80 km

ERS-AMI — **ERS Synthetic Aperture Radar** — SAR

Stereo Capability: Off Axis Repeat:

Band(s)					Resolution	Swath
ERS-AMI1	C-BAND	5.360 -	GHz	VV Image	30.0 m	100 km
ERS-AMI2	C-BAND	5.360 -	GHz	LV Wave	30.0 m	100 km

Eyeglass — **Orbital Sciences & Eyeglass International**

Agency: CIV Country: USA loc: 01/01/97 Eom: / /

Orbit: SUN SYNCHRONOUS Apogee 710 km Perigee 710 km Incl.: 0.0° Repeat: 197 Days

Eyeglass — **Eyeglass** — E-O

Stereo Capability: Fwd/Aft Off Axis Repeat: 2 Days

Band(s)				Resolution	Swath
EYEGLASS-P	VISIBLE	0.400 -	0.700 um	1.0 m	15 km

IRS-C/D — **Indian Resources Satellite C & D**

Agency: ISRO Country: INDIA loc: 01/30/94 Eom: / /

Orbit: SUN SYNCHRONOUS Apogee 900 km Perigee 900 km Incl.: 99.5° Repeat: 5-24 Days

LISS-3 — **Linear Self Scanning Sensor 3** — MSI

Stereo Capability: Off Axis Repeat:

Band(s)				Resolution	Swath
LISS-3A	GREEN	0.520 -	0.590 um	20.0 m	140 km
LISS-3B	RED	0.620 -	0.680 um	20.0 m	140 km
LISS-3C	NIR	0.770 -	0.860 um	20.0 m	140 km
LISS-3PAN	VISIBLE	0.500 -	0.750 um	10.0 m	70 km

JERS-1 — **Japanese-Earth Resources Satellite**

Agency: NASDA Country: JAPAN loc: 02/11/92 Eom: / /

Orbit: SUN SYNCHRONOUS Apogee 568 km Perigee 568 km Incl.: 97.7° Repeat: 44 Days

JERS-SAR — **JERS Synthetic Aperture Radar** — SAR

Stereo Capability: Off Axis Repeat:

Band(s)					Resolution	Swath
L-SAR	L-BAND	1.275 -	GHz	HH	18.0 m	75 km

OPS — **JERS Optical Sensor** — MSI

Stereo Capability: Fwd/Aft Off Axis Repeat:

Band(s)					Resolution	Swath
SWIR-1	SWIR	1.600 -	1.700 um		18.0 m	75 km
SWIR-2	SWIR	2.050 -	2.150 um		18.0 m	75 km
SWIR-3	SWIR	2.150 -	2.250 um		18.0 m	75 km
SWIR-4	SWIR	2.200 -	2.400 um		18.0 m	75 km
VNIR 1	GREEN	0.520 -	0.600 um		18.0 m	150 km
VNIR 2	RED	0.630 -	0.690 um		18.0 m	150 km
VNIR 3	NIR	0.760 -	0.860 um	Nadir Stereo	18.0 m	150 km
VNIR 4	NIR	0.760 -	0.860 um	Forward Stereo	18.0 m	75 km

LANDSAT4/5 — **Land Satellite**

Agency: EOSAT Country: USA loc: 01/01/82 Eom: / /

Orbit: SUN SYNCHRONOUS Apogee 705 km Perigee 705 km Incl.: 98.2° Repeat: 16 Days

TM — **Thematic Mapper** — MSI

Stereo Capability: Off Axis Repeat:

Band(s)				Resolution	Swath
TM-1	BLUEGREEN	0.450 -	0.520 um	30.0 m	185 km
TM-2	GREEN	0.520 -	0.600 um	30.0 m	185 km
TM-3	RED	0.630 -	0.690 um	30.0 m	185 km
TM-4	NIR	0.760 -	0.900 um	30.0 m	185 km
TM-5	SWIR	1.550 -	1.750 um	30.0 m	185 km

TM-7	SWIR	2.080 -	2.350 um		30.0 m	185 km

RADARSAT — **RADARSAT**

Agency: CSA | Country: CANADA | loc: 03/01/95 | Eom: / /

Orbit: SUN SYNCHRONOUS | Apogee 800 km | Perigee 800 km | Incl.: 98.6° | Repeat: 6 Days

C-Band SAR — **RADARSAT, Synthetic Aperture Radar** — SAR

Stereo Capability: | Off Axis Repeat:

Band(s)					Resolution	Swath
EXTENDED-1	C-BAND	5.360 -	GHz	HH Extd1	19.0 m	75 km
EXTENDED-2	C-BAND	5.360 -	GHz	HH Extd2	28.0 m	170 km
FINE	C-BAND	5.360 -	GHz	HH Fine	9.0 m	45 km
STANDARD	C-BAND	5.360 -	GHz	HH STD	25.0 m	100 km
WIDE-1	C-BAND	5.360 -	GHz	HH Wide	28.0 m	165 km
WIDE-2	C-BAND	5.360 -	GHz	HH Wide	25.0 m	150 km

RESURS-F — **Russian Earth Resource Satellite -F Series**

Agency: RSA | Country: RUSSIA | loc: 01/01/75 | Eom: / /

Orbit: POLAR | Apogee 240 km | Perigee 275 km | Incl.: 82.3° | Repeat: n/a

KFA-1000 — **Camera System 1000mm** — CAM

Stereo Capability: Fwd/Aft | Off Axis Repeat:

Band(s)					Resolution	Swath
KFA-1000-L	VNIR	0.570 -	0.800 um	Left	5.0 m	120 km
KFA-1000-R	VNIR	0.570 -	0.800 um	Right	5.0 m	120 km

KFA-200 — **Camera System 200 mm** — CAM

Stereo Capability: Fwd/Aft | Off Axis Repeat:

Band(s)				Resolution	Swath
KFA-200-1	GREEN	0.510 -	0.600 um	25.0 m	180 km
KFA-200-2	NIR	0.700 -	0.840 um	25.0 m	180 km
KFA-200-3	RED	0.600 -	0.700 um	25.0 m	180 km

MK-4 — **4-Channel Camera System 300mm** — CAM

Stereo Capability: Fwd/Aft | Off Axis Repeat:

Band(s)				Resolution	Swath
MK-4-1	RED	0.640 -	0.690 um	14.0 m	144 km
MK-4-2	NIR	0.810 -	0.860 um	14.0 m	144 km
MK-4-3	GREEN	0.515 -	0.565 um	14.0 m	144 km
MK-4-4	BLUEGREEN	0.460 -	0.510 um	14.0 m	144 km
MK-4-5	RED	0.610 -	0.750 um	14.0 m	144 km
MK-4-6	VISIBLE	0.435 -	0.680 um	14.0 m	144 km

SEASAT — **Sea Satellite**

Agency: NOAA | Country: USA | loc: 07/07/78 | Eom: 10/09/78

Orbit: ELLIPTICAL | Apogee 800 km | Perigee 776 km | Incl.: 108.0° | Repeat: n/a

SEASAT-SAR — **Seasat Synthetic Aperture Radar** — SAR

Stereo Capability: | Off Axis Repeat:

Band(s)					Resolution	Swath
SEASAT-SAR	L-BAND	1.350 -	GHz	HH	25.0 m	100 km

SPOT 1 & 2 — **Satellite Probatoire de l'Observation de la Terre**

Agency: CNES | Country: FRANCE | loc: 01/01/86 | Eom: / /

Orbit: SUN SYNCHRONOUS | Apogee 832 km | Perigee 832 km | Incl.: 98.7° | Repeat: 26 Days

HRV — **High Resolution Visible Sensor** — E-O MSI

Stereo Capability: Cross Track | Off Axis Repeat: 2 Days

Band(s)					Resolution	Swath
HRV PAN	VISIBLE	0.510 -	0.730 um	Stereo	10.0 m	60 km
HRV-1	GREEN	0.500 -	0.590 um		20.0 m	60 km

HRV-2	RED	0.610 -	0.680um	20.0 m	60 km
HRV-3	NIR	0.790 -	0.890um	20.0 m	60 km

SPOT 3 — **Satellite Probatoire de l'Observation de la Terre**

Agency: CNES | Country: FRANCE | loc: 09/26/93 | Eom: / /

Orbit: SUN SYNCHRONOUS | Apogee 832 km | Perigee 832km | Incl.: 98.7° | Repeat: 26 Days

HRV — **High Resolution Visible Sensor** — E-O MSI

Stereo Capability: Cross Track | Off Axis Repeat: 2 Days

Band(s)					Resolution	Swath
HRV PAN	VISIBLE	0.510 -	0.730um	Stereo	10.0 m	60 km
HRV-1	GREEN	0.500 -	0.590um		20.0 m	60 km
HRV-2	RED	0.610 -	0.680um		20.0 m	60 km
HRV-3	NIR	0.790 -	0.890um		20.0 m	60 km

SPOT 4 — **Satellite Probatoire de l'Observation de la Terre**

Agency: CNES | Country: FRANCE | loc: 01/01/97 | Eom: / /

Orbit: SUN SYNCHRONOUS | Apogee 832 km | Perigee 832km | Incl.: 98.7° | Repeat: 26 Days

HRVIR — **High Resolution Visible and Infrared Sensor** — E-O MSI

Stereo Capability: Cross Track | Off Axis Repeat: 2 Days

Band(s)				Resolution	Swath
HRVIR-1	BLUEGREEN	0.430 -	0.470um	20.0 m	85 km
HRVIR-2	GREEN	0.500 -	0.590um	20.0 m	85 km
HRVIR-3	RED	0.610 -	0.680um	10.0 m	85 km
HRVIR-4	NIR	0.780 -	0.890um	20.0 m	85 km
HRVIR-5	SWIR	1.580 -	1.750um	20.0 m	85 km
HRVIR-PAN	VISIBLE	.0510 -	0.730um	10.0 m	85 km

WorldView — **World View Imaging Corp**

Agency: CIV | Country: USA | loc: 12/31/95 | Eom: / /

Orbit: SUN SYNCHRONOUS | Apogee 475 km | Perigee 475km | Incl.: 98.0° | Repeat: 120 Days

WV-MSS — **WorldView Multispectral Scanner** — MSI

Stereo Capability: | Off Axis Repeat: 2 Days

Band(s)				Resolution	Swath
WV-1	GREEN	0.600 -	0.600um	15.0 m	900 km
WV-2	RED	0.610 -	0.680um	15.0 m	900 km
WV-3	NIR	0.790 -	0.890um	15.0 m	900 km

WV-Stereo — **WorldView Stereo Sensor** — E-O

Stereo Capability: Fwd/Aft | Off Axis Repeat:

Band(s)				Resolution	Swath
WV-PAN	VISIBLE	0.450 -	0.800um	3.0 m	36 km

Appendix D: Database Listing of Users and Missions

CENTRAL INTELLIGENCE AGENCY			CIA
NATIONAL PHOTOGRAPHIC INTERPRETATION CENTER			NPIC
National Photographic Interpretation Center	Bldg 213		Phone
Mission(s)	Washington	DC 20230	Fax
Monitor Foreign Nuclear Weapons Development & Proliferation			
Operational Intelligence			
Basic Intelligence			
Intelligence Estimates			
Remote Sensing Research and Development			
Arms Traffic Monitoring			
Scientific & Technical Intelligence			
Agricultural Crop Statistics			
Strategic Intelligence			
COMMERCE DEPARTMENT			**DOC**
NATIONAL OCEANIC & ATMOSPHERIC ADMINISTRATION			NOAA
National Climatic Data Center	Federal Bldg.		Phone 704-259-0476
Mission(s)	Asheville	NC 28801	Fax
Global Climate Studies			
National Environmental Satellite Data & Information Service	World Weather Bldg, Rm 810		Phone 301-763-8127
Mission(s)	Camp Springs	MD 20233	Fax
Remote Sensing Product Development			
National Geophysical Data Center	325 Broadway		Phone 303-497-6215
Mission(s)	Boulder	CO 80303	Fax
Geophysical Research			
National Marine Fisheries Service	1335 East West Hwy		Phone 301-427-2239
Mission(s)	Silver Spring	MD 20910	Fax
Fishery Data Analysis			
National Ocean Service, Coast & Geodetic Survey	6001 Executive Blvd.		Phone 301-443-8204
Mission(s)	Rockville	MD 20852	Fax
Coastal Charting			
National Ocean Service, Earth Science & Geoscience Lab	1140 Rockville Pike		Phone 301-443-8858
Mission(s)	Rockville	MD 20852	Fax
Earth Science			
Global Change Research			
Geophysical Research			
National Oceanographic Data Center	1825 Connecticut Ave. NW		Phone 202-673-5594
Mission(s)	Washington	DC 20235	Fax
Oceanography			
National Weather Service	1325 East West Hwy		Phone 310-427-7689
Mission(s)	Rockville	MD 20910	Fax
Flood Prediction			
Weather Forecasting & Monitoring			
National Weather Service, Nat'l Opns Hydrologic Remote Sensing	6301-34th Ave. South		Phone 612-725-3039
Mission(s)	Minneapolis	MN 55450	Fax
Weather Forecasting & Monitoring			
DEPARTMENT OF AGRICULTURE			**USDA**
AGRICULTURAL RESEARCH SERVICE			ARS
Remote Sensing Lab	Bldg. 001 Rm. 334		Phone 301-504-6822
Mission(s)	Beltsville	MD 20705-2350	Fax
Remote Sensing Product Development			
FOREST SERVICE			USFS
Fire & Atmosphereic Science Research Staff	201 14th St. SW, 1st Floor Center		Phone 202-205-1561
Mission(s)	Washington	DC 20250	Fax
Wildfire Prevention			
Fire Research in Forest Environments			
Forest Evironment Research Staff	201 14th St. SW, 1st Floor Center		Phone 202-205-1524
Mission(s)	Washington	DC 20250	Fax
Forest Environment Research			

Forest Insects & Desease Research Staff	201 14th St. SW, 1st Floor SW		Phone 202-205-1532
Mission(s)	Washington	DC 20250	Fax
Forest Insect & Disease Research			
Forest Inventory, Economic and Recreation Staff	201 14th St. SW, 1st Floor SW		Phone 202-205-1747
Mission(s)	Washington	DC 20250	Fax
Conduct National Forest Inventory			
Headquarters	201 14th St. SW		Phone 202-205-1760
Mission(s)	Washington	DC 20250	Fax
Forest Protection			
International Forestry Staff	201 14th St. SW, 1st Floor SW		Phone 202-205-1092
Mission(s)	Washington	DC 20250	Fax
International Forest Monitoring			
NATIONAL AGRICULTURAL STATISTICS SERVICE		**NASS**	
Headquarters	Independence Ave, Between 12 & 14th		Phone 202-720-2707
Mission(s)	Washington	DC 20250	Fax
Agricultural Crop Statistics			
NASS Research & Applications Division, Remote Sensing Section	Independence Ave, Between 12 & 14th		Phone 202-720-6783
Mission(s)	Washington	DC 20250	Fax
Agricultural Crop Statistics			
SOIL CONSERVATION SERVICE		**SCS**	
Soil Conservation Service	South Agriculture Bldg. Rm. 5105A		Phone 202-720-4525
Mission(s)	Washington	DC 20250	Fax
Soil Classification and Protection			
DEPARTMENT OF DEFENSE		**DOD**	
ADVANCED RESEARCH PROJECTS AGENCY		**ARPA**	
ARPA Nuclear Monitoring Research Office	3701 N. Fairfax Dr.		Phone 703-696-2246
Mission(s)	Arlington	VA 22203-1714	Fax
Monitor Foreign Nuclear Weapons Development & Proliferation			
ARPA Software & Intelligent System Technology	3701 N. Fairfax Dr.		Phone 703-696-2222
Mission(s)	Arlington	VA 22203	Fax
Automatic Target Recognition R&D			
Advanced System Technology Office	3701 N. Fairfax Dr.		Phone 703-696-2307
Mission(s)	Arlington	VA 22203-1700	Fax
Sensor Research & Development			
Headquarters	3701 N. Fairfax Dr.		Phone 703-696-2400
Mission(s)	Arlington	VA 22203-1714	Fax
Defense Related R&D			
DEFENSE INTELLIGENCE AGENCY		**DIA**	
DA	The Pentagon		Phone
Mission(s)	Washington	DC 20301	Fax
Operational Intelligence, Air, Land & Naval			
DB	The Pentagon		Phone
Mission(s)	Washington	DC 20301	Fax
Basic Intelligence			
DC	The Pentagon		Phone
Mission(s)	Washington	DC 20301	Fax
Scientific & Technical Intelligence			
DIAC	Bolling AFB		Phone 202-373-2880
Mission(s)	Washington	MD 20340-3205	Fax
Intelligence Estimates			
DEFENSE LOGISTICS AGENCY		**DLA**	
Defense Technical Information Center, IR Information Center	ERIM PO Box 134001		Phone 313-994-1200
Mission(s)	Ann Arbor	MI 48113-4001	Fax
Infrared and Spectral Signature Database			
DEFENSE MAPPING AGENCY		**DMA**	
Division of Cadastral Survey	3200 South Second St.		Phone
Mission(s)	St. Louis	MO 63118-3399	Fax
Coastal Charting			
Terrestrial Mapping			

DEFENSE NUCLEAR AGENCY			DNA	
Headquarters	Kirtland AFB			Phone 505-844-5120
Mission(s)		NM	87115-5000	Fax
Monitor Foreign Nuclear Weapons Development & Proliferation				
JOINT CHIEFS OF STAFF			JCS	
JCS J-2	The Pentagon			Phone
Mission(s)	Washington	DC	20302-7100	Fax
Operational Intelligence, Joint				
STRATEGIC DEFENSE INITIATIVE OFFICE			SDIO	
Headquarters	The Pentagon, 1E1081			Phone 703-695-7060
Mission(s)	Washington	DC	20302-7100	Fax
Space Defense Systems Development				
Sensor and Interceptor Technology Directorate	The Pentagon, 1E168			Phone 703-693-1671
Mission(s)	Washington	DC	20302-7100	Fax
Sensor Research & Development				
U.S. ATLANTIC COMMAND			LANTCO	
JICLANT				Phone
Mission(s)	Norfolk	VA		Fax
Intelligence Support to Warfighters				
U.S. CENTRAL COMMAND			CENTCO	
CENTCOM J-2	Mac Dill AFB			Phone
Mission(s)		FL		Fax
Intelligence Support to Warfighters				
U.S. EUROPEAN COMMAND			EUCOM	
EUCOM J-2				Phone
Mission(s)				Fax
Intelligence Support to Warfighters				
U.S. PACIFIC COMMAND			PACCOM	
JICPAC				Phone
Mission(s)	Pearl Harbor	HI		Fax
Intelligence Support to Warfighters				
U.S. SOUTHERN COMMAND			SOUTHC	
USCS J-2				Phone
Mission(s)	Panama City	PM		Fax
Intelligence Support to Warfighters				
U.S. STRATEGIC COMMAND			STRATC	
SCJ-2	Offutt AFB			Phone
Mission(s)	Omaha	NE		Fax
Intelligence Support to Warfighters				
DEPARTMENT OF ENERGY			**DOE**	
DOE DEFENSE PROGRAM OFFICE			DPO	
DPO	Mail Stop DP-1			Phone 202-586-2177
Mission(s)	Washington	DC	20545	Fax
Environmental Impact Assessment & Monitoring				
DOE FIELD OFFICES			ALB	
Albuquerque	PO Box 5400			Phone 505-845-6049
Mission(s)	Albuquerue	NM	87185	Fax
Environmental Impact Assessment & Monitoring				
Chicago	9800 S. Cass Ave.			Phone 708-252-2010
Mission(s)	Argonne	IL	60439	Fax
Environmental Impact Assessment & Monitoring				
Idaho	785 DOE Place			Phone 208-526-1322
Mission(s)	Idaho Falls	ID	83401-1562	Fax
Environmental Impact Assessment & Monitoring				
Nevada	PO Box 98518			Phone 702-295-1000
Mission(s)	Las Vegas	NV	89193-8518	Fax
Environmental Impact Assessment & Monitoring				
Nuclear Test Assessment				

Oak Ridge	PO Box 2001		Phone 615-576-4444
Mission(s)	Oak Ridge	TN 37831	Fax
Environmental Impact Assessment & Monitoring			
Richland	PO Box 1970, Mail Stop B3-01		Phone 509-376-3997
Mission(s)	Richlands	WA 99352	Fax
Environmental Impact Assessment & Monitoring			
San Fransisco	1333 Broadway		Phone 510-273-7111
Mission(s)	Oakland	CA 94612	Fax
Environmental Impact Assessment & Monitoring			
Savannah River	PO Box A		Phone 803-725-2277
Mission(s)	Aiken	SC 29802	Fax
Environmental Impact Assessment & Monitoring			
DOE FOSSIL ENERGY PROGRAM OFFICE		**FEP**	
	1000 Independence Ave.SW Rm. 4G084		Phone 202-586-6660
Mission(s)	Washington	DC 20545	Fax
Environmental Impact Assessment & Monitoring			
OFFICE OF HEALTH & ENVIRONMENTAL RESEARCH		**HER**	
	Mail Stop ER-70, GTN		Phone 301-353-3251
Mission(s)	Washington	DC 20545	Fax
Environmental Impact Assessment & Monitoring			
OFFICE OF MILITARY APPLICATIONS		**OMA**	
	A-367 GTN		Phone 301-353-4221
Mission(s)	Washington	DC 20545	Fax
Nuclear Weapons Production & Testing			
OFFICE OF NUCLEAR MATERIALS PRODUCTION		**NMP**	
	DOE DP-GTN		Phone 202-586-2185
Mission(s)	Washington	DC 20545	Fax
Nuclear Material Production			
DEPARTMENT OF JUSTICE		**DOJ**	
DRUG ENFORCEMENT AGENCY		**DEA**	
Office of Intelligence	DEA Office of Intelligence		Phone 202-307-8050
Mission(s)	Washington	DC 20537	Fax
Counter Drug Law Enforcement			
FEDERAL BUREAU OF INVESTIGATION		**FBI**	
	Ninth St. and Penna. Ave NW		Phone 202-324-3000
Mission(s)	Washington	DC 20535	Fax
Law Enforcement			
DEPARTMENT OF THE AIR FORCE		**USAF**	
AIR FORCE INTELLIGENCE OFFICE		**AFOI**	
Headquarters	The Pentagon		Phone
Mission(s)	Washigton	DC 20302-7100	Fax
Operational Intelligence, Air			
AIR FORCE MATERIAL COMMAND		**AFMC**	
Electronic Systems Division	Hanscom AFB		Phone 617-377-5111
Mission(s)	Bedford	MA 01730-5000	Fax
Electronic Systems Development			
Headquarters	Andrews AFB		Phone 301-981-3241
Mission(s)	Washington	DC 20334-5000	Fax
Air Combat Systems Development			
Phillips Laboratory	Hanscom AFB		Phone 617-377-3601
Mission(s)	Bedford	MA 01730-5000	Fax
Sensor Research & Development			
ROME Laboratory	Griffiss AFB		Phone 315-330-3053
Mission(s)	Rome	NY 13441	Fax
Sensor Research & Development			
Wright Laboratory	Wright Patterson AFB		Phone 513-255-5508
Mission(s)	Dayton	OH 45433-6523	Fax
Scientific & Technical Intelligence, Air			

AIR FORCE SPACE COMMAND			AFSC	
Air Force Weather Service				Phone
Mission(s)				Fax
Weather Forecasting & Monitoring				
Program Offices				Phone
Mission(s)	Los Angeles	CA		Fax
Sensor Design and Applications Development				
DEPARTMENT OF THE ARMY			**USA**	
ARMY CORPS OF ENGINEERS			COE	
Topographic Engineering Center				Phone 703-355-2600
Mission(s)	Ft. Belvoir	VA	22060-5546	Fax
Terrestrial Mapping				
Water Resourses Support Center				Phone 202-355-3062
Mission(s)	Ft. Belvoir	VA	22060-5586	Fax
Hydrologic Monitoring and Research				
Waterways Experiment Station	3209 Halls Ferry Rd.			Phone 601-636-3111
Mission(s)	Vicksberg	MS	39180-6199	Fax
Waterway Monitoring and Maintenance				
Flood Prevention/Control				
ARMY INTELLIGENCE OFFICE			AIO	
Headquarters				Phone
Mission(s)				Fax
Operational Intelligence, Land				
ARMY MATERIAL COMMAND			AMC	
AMZPA	5001 Eisenhower Ave			Phone 201-274-8010
Mission(s)	Alexandria	VA	22333-0001	Fax
Land Combat Systems Development				
USA Armament R&D Center Infrared Lab	SMCAR-FSP-E, B1530			Phone 201-724-3116
Mission(s)	Picatinny Arsenal	NJ	07806-5000	Fax
Infrared Sensor Development and Countermeasures				
NATICK RESEARCH, DEVELOPMENT AND ENGINERRING			NRDEC	
Individual Protection Directorate	Kansas St.			Phone 508-651-4308
Mission(s)	Natick	MA	01760-5000	Fax
Camouflage Development				
DEPARTMENT OF THE NAVY			**USN**	
CHIEF OF NAVAL OPERATIONS			CNO	
Center for Naval Analysis	4401 Ford Ave.			Phone 703-824-2000
Mission(s)	Alexandria	VA	22302-0268	Fax
Antisubmarine Warfare Studies				
David Taylor Research Center(s)				Phone 202-227-1515
Mission(s)	Bethesda	MD	20084-5000	Fax
Ship and Submarine Signature Reduction				
Fleet Weather Facility				Phone
Mission(s)				Fax
Weather Forecasting & Monitoring				
Naval Air Development Center	Street Rd			Phone 215-441-3067
Mission(s)	Warmister	PA	18974-5000	Fax
Sensor Research & Development				
Naval Ocean Systems Center NOSC	271 Catalina Blvd.			Phone 619-553-3000
Mission(s)	San Diego	CA	92152-5000	Fax
Collection Management Systems				
Naval Oceanographic Office NAVOCEANO	Bldg. 1002			Phone 601-688-4203
Mission(s)	Stennis Space Center	MS	39522-5001	Fax
Oceanography				
Naval Polar Operations Center				Phone
Mission(s)				Fax
Polar Research				
Naval Space Command				Phone 703-663-7841
Mission(s)	Dahlgren	VA	22448-5170	Fax

Coastal Zone Studies
Ocean Surveillance Systems

Navy Space Systems Activity	PO Box 92960			Phone 310-363-1824
Mission(s)	Los Angeles	CA	90009	Fax
Sensor Design and Applications Development				
Space & Naval Warfare System Command				Phone 703-692-8768
Mission(s)	Washington	DC	20363-5100	Fax
Sensor Design and Applications Development				
OFFICE OF NAVAL INTELLIGENCE			ONI	
Headquarters	Federal Center			Phone
Mission(s)	Suitland	MD		Fax
Scientific & Technical Intelligence, Naval				
Naval Maritime Intel Center	Federal Center			Phone
Mission(s)	Suitland	MD		Fax
Operational Intelligence, Naval				
OFFICE OF NAVAL RESEARCH			ONR	
Director	800 N. Quincy St.			Phone 703-696-5031
Mission(s)	Arlington	VA	22217-5000	Fax
Ocean Engineering				
Institue for Naval Oceanography				Phone 601-688-5737
Mission(s)	Stennis Space Center	MS	39529-5005	Fax
Oceanography				
Naval Oceanographic & Atmospheric Research Lab	Bldg. 1005			Phone 601-688-4010
Mission(s)	Stennis Space Center	MS	39529-5004	Fax
Remote Sensing Applications Development				
Naval Research Laboratory	4555 Overlook Ave. SW, Code 1000			Phone 202-767-3403
Mission(s)	Washington	DC	20375	Fax
Sensor Design and Applications Development				
Ocean Sciences Directorate	800 N. Quincy St.			Phone 703-696-4398
Mission(s)	Washington	DC	22217-5000	Fax
Polar Research				
Coastal Zone Studies				
U.S.MARINE CORPS			USMC	
CMC G-2	The Pentagon Navy Annex			Phone
Mission(s)				Fax
Operational Intelligence, Joint				
USMC Combat Development Center	MCDEC			Phone 703-640-2268
Mission(s)	Quantico	VA	22134-5001	Fax
Intelligence Support to Warfighters				
DEPARTMENT OF TRANSPORTATION			**DOT**	
FEDERAL AVIATION ADMINISTRATION			FAA	
FAA Technical Center	Atlantic City Intl Airport			Phone 609-484-4000
Mission(s)	Atlantic City	NJ	08405	Fax
Air Safety and Navigation Support				
FEDERAL HIGHWAY ADMINISTRATION			FHA	
				Phone
				Fax
Mission(s)				
Highway Construction, Safety and Maintenance				
FEDERAL RAILROAD ADMINISTRATION			FRA	
				Phone
				Fax
Mission(s)				
Railway Construction, Safety and Maintenance				
MARITIME ADMIN.			MA	
				Phone
				Fax
Mission(s)				
Ports and Harbors Monitoring Safety and Navigation				
U.S. COAST GUARD			USCG	
Headquarters	1082 Shennecossett			Phone 203-441-2600
Mission(s)	Groton	CT	06340-6096	Fax

Maritime Law Enforcement
Coastal Pollution Monitoring
Ice Berg Monitoring
Maritime Search & Rescue

URBAN MASS TRANSPORT ADMINISTRATION			UMTA	
				Phone
				Fax
Mission(s)				
Mass Transport Systems				
DEPT. OF THE INTERIOR			**DOI**	
BUREAU OF LAND MANAGEMENT			BLM	
Cadastral Survey Division	222 W. 7th Ave. #13			Phone 907-271-5063
Mission(s)	Anchorage	AK	99513	Fax
Land Use Inventory and Management				
BUREAU OF MINES			BM	
	2401 E. St. NW			Phone 202-634-1300
Mission(s)	Washington	DC	20241	Fax
Monitor Mines and Land Rehabilitation				
BUREAU OF RECLAIMATION			BLR	
	1849 C. St. NW Rm. 7654			Phone 202-208-4157
Mission(s)	Washington	DC	20240	Fax
Monitor Rehabilitation of Land Resources				
FISH & WILDLIFE SERVICE			FWS	
	1849 C St. NW			Phone 202-208-4717
Mission(s)	Washington	DC	20240	Fax
Monitor and Manage Wildlife Habitats				
MINERALS MANAGEMENT SERVICE			MMS	
	1849 C. St. NW			Phone 202-208-3500
Mission(s)	Washington	DC	20240	Fax
Monitor and Manage Offshore Minerals, Oil and Gas				
NATIONAL PARK SERVICE			NPS	
Archeological Assistance Division	PO Box 37127			Phone 202-343-4101
Mission(s)	Washington	DC	20012-7127	Fax
Flood Prevention/Control				
Land Search & Rescue				
Archeology				
Natural Resourse Preservation				
Wildfire Prevention				
OFFICE OF SURFACE MINING, RECLAIMATION & ENFORCEMENT			SMRE	
Technical Standards Branch	1951 Constitution Ave. NW			Phone 202-343-1507
Mission(s)	Washington	DC	20240	Fax
Monitor Surface Mining Activity in U.S.				
U.S. GEOLOGIC SURVEY			USGS	
National Mapping Division	516 Natl Cen. 12201 Sunrise Valley			Phone 703-648-5747
Mission(s)	Reston	VA	22092	Fax
Terrestrial Mapping				
ENVIRONMENTAL PROTECTION AGENCY			**EPA**	
EARTH SCIENCES DIRECTORATE			ESD	
Ecological Support Branch	College Station Rd.			Phone 404-546-3136
Mission(s)	Athens	GA	30613	Fax
Environmental Impact Assessment & Monitoring				
ENVIRONMENTAL SERVICES CENTER			ESD	
Ecological Support Branch	College Station Rd.			Phone 404-546-3136
Mission(s)	Athens	GA	30613	Fax
Environmental Impact Assessment & Monitoring				
NATIONAL INVESTIGATIONS ENFORCEMENT CENTER			NIEC	
	PO Box 25227			Phone 303-236-5100
Mission(s)	Denver	CO	80225	Fax
Environmental Law Enforcement				

FEDERAL EMERGENCY MANAGEMENT AGENCY — **FEMA**

DAMAGE ASSESSMENTS — ODA

Phone
Fax

Mission(s)
Damage Assessment and Remediation

HOUSING & URBAN DEVELOPMENT — **HUD**

COMMUNITY PLANNING AND DEVELOPMENT — CPD

451 7th St. SW
Washington DC 20410
Phone 202-708-2504
Fax

Mission(s)
Urban Planning and Development

NATIONAL AERONAUTICS & SPACE ADMINISTRATION — **NASA**

ALASKA SAR FACILITY — ASF

600 Independence Ave. SW
Washington DC 20546
Phone 202-453-1409
Fax

Mission(s)
High Altitude Vegetation Studies
Northern Geology
Polar Research

EARTH SCIENCES DIRECTORATE — ESD

Mail Code 900
Greenbelt MD 20771
Phone 301-286-8834
Fax

Mission(s)
Remote Sensing Research and Development

ENVIRONMENTAL SERVICES CENTER — ESD

Mail Code 900
Greenbelt MD 20771
Phone 301-286-8834
Fax

Mission(s)
Remote Sensing Research and Development

GODDARD SPACE FLIGHT CENTER — GSFC

Terrestrial Physics Lab
Mail Code 920
Green Belt MD 20771
Phone 301-286-6481
Fax

Mission(s)
Global Circulation
Oceanography
Global Climate Studies
Infrared Thermal Sensor Development & Applications
Earth Science

HEADQUARTERS — NASA

NASA Headquarters
Washington DC 20546
Phone 202-453-2019
Fax

Mission(s)
Space Research

JET PROPULSION LAB — JPL

California Inst Of Technology
4800 Oak Grove Dr.
Pasadena CA 91109
Phone 818-354-4321
Fax

Mission(s)
Remote Sensing Research and Development

JOHN C. STENNIS SPACE CENTER — JSSC

Bldg. 1100
Stennis Space Center MS 39529
Phone 601-688-2121
Fax

Mission(s)
Oceanography
Global Change Research
Earth Science

NATIONAL SCIENCE FOUNDATION — **NSF**

DIRECTORATE OF ENGINEERING — NMMHMP

Natural & Man Made Hazzard Mitigation Program
1800 G ST. NW
Wachington DC 20550
Phone 202-357-9780
Fax

Mission(s)
Characterize Natural and Manmade Hazards

Directorate for Geosciences — DG

Earth Sciences Division
1800 G St. NW
Washington DC 20550
Phone 202-357-7958
Fax

Mission(s)
Dispersal of Pollutants

Ocean Sciences Division
1800 G St. NW
Washington DC 20550
Phone 202-357-9639
Fax

Mission(s)

Oceanography

NON-GOVERNMENT ORGANIZATION — **NGO**

ENVIRONMENTAL DEFENSE FUND — EDF

Phone
Fax

Mission(s)
Global Change Research
Environmental Impact Assessment & Monitoring
Polar Research

NUCLEAR REGULATORY COMMISSION — **NRC**

OFFICE OF NUCLEAR REGUALTORY RESEARCH — ONRR

5650 Nicholson Ln.
Rockville MD 20555
Phone 301-492-0240
Fax

Mission(s)
Monitor Foreign Nuclear Weapons Development & Proliferation

STATE DEPARTMENT — **STATE**

BUREAU OF INTELLIGENCE & RESEARCH — BIR

INR
2201 C ST. NW
Washington DC 20520
Phone 202-467-2222
Fax

Mission(s)
Intelligence Estimates

TENNESEE VALLEY AUTHORITY — **TVA**

RIVER BASINS OPERATIONS, SYSTEMS ENGINEERING — MSD

Maps & Surveys Dept
1101 Market St., HB-2A
Chattanooga TN 37402-2801
Phone 615-751-5425
Fax

Mission(s)
Terrestrial Mapping

U.S. ARMS CONTROL AGENCY — **USACA**

ENVIRONMENTAL ASSESSMENTS

320 21st St. NW
Washington DC 20451
Phone 202-647-9610
Fax

Mission(s)
Arms Treaty Monitoring

RESEARCH AND ANALYSIS — RA

Phone
Fax

Mission(s)
Arms Treaty Monitoring
Arms Traffic Monitoring
Monitor Foreign Nuclear Weapons Development & Proliferation

UNITED NATIONS — **UN**

ENVIRONMENTAL ASSESSMENTS

Phone
Fax

Mission(s)
Environmental Impact Assessment & Monitoring

FOOD AND AGRICULTURE ORGANIZATION — FAO

Phone
Fax

Mission(s)
Agricultural Crop Statistics
Fishery Data Analysis

WORLD BANK — **UN**

ENVIRONMENTAL ASSESSMENTS

Phone
Fax

Mission(s)
Environmental Impact Assessment & Monitoring

FOOD AND AGRICULTURE ORGANIZATION — FAO

Phone
Fax

Mission(s)
Fishery Data Analysis
Agricultural Crop Statistics

Appendix E: Glossary of Terms

Some of the terms used inTable 1 require definitions:

• GSD, Ground Sample Distance; The diameter of the sensors resolution cell on the ground assuming some nominal operational altitude. GSD = Hxb where H is the altitude and b is the instantaneous field of view of the sensor (IFOV) measure in radians. For photographic systems GRD (Ground Resolved Distance) is still used. GRD = Image Scale Reciprocal/ line per 1000mm/m

• IPR, Impulse Response;a measure of the spatial resolution of an imaging radar. The spatial width of a radar return for a point reflector measured in range or azimuth 3dB down from the peak.

• NIIRS, National Imagery Interpretation Rating Scale, developed within the U.S. imagery intelligence community. It rates imagery based on its utility to identify particular objects of intelligence interest.

• Sidelobe Envelope, a measure of sidelobes in radar imagery.

• SNR, Signal to Noise Ratio, the ratio signal to noise, usually expressed in dB.

• Band of Operation, the range of frequencies of electromagnetic energy to which a sensor responds.

• Center Frequency, in the case of a SAR, the middle frequency of the FM chirp. A primary factor in determining the radar's sensitivity to surface roughness, surface waves, vegetation and ground penetration, soil moisture, and ice classification.

• Bandwidth, in the case of a SAR, frequency range of the FM chirp. The primary determining factor in range resolution.

• CR, Contrast Ratio, the ratio of the brightest to the dimmest points in an image. May be affected by atmospheric condition such as haze, and by response time of detectors.

• Gamma, a photographic term describing the slope of the film response curve. It is analogous to "Responsivity" for electronic detectors.

• NEΔT, Noise Equivalent Temperature, the temperature level that equals the noise in a thermal sensor system, a measure of the lowest temperature detectable by the system.

• NE$\Delta\rho$, Noise Equivalent Change in Reflectivity, the power level that equals the noise in the sensor system, a measure of the lowest power signal detectable by a electro-optical system.

• NEP, Noise Equivalent Power, the reflectivity percentage that produces a radiance level equal to the noise in the sensor system, a measure of the lowest power signal detectable by the sensor.